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San Francisco, Calif.

April 1, 1926
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Journal of Electricity

Devoted to the Economic Production and Commercial Application of Electricity
IN THE ELEVEN WESTERN STATES

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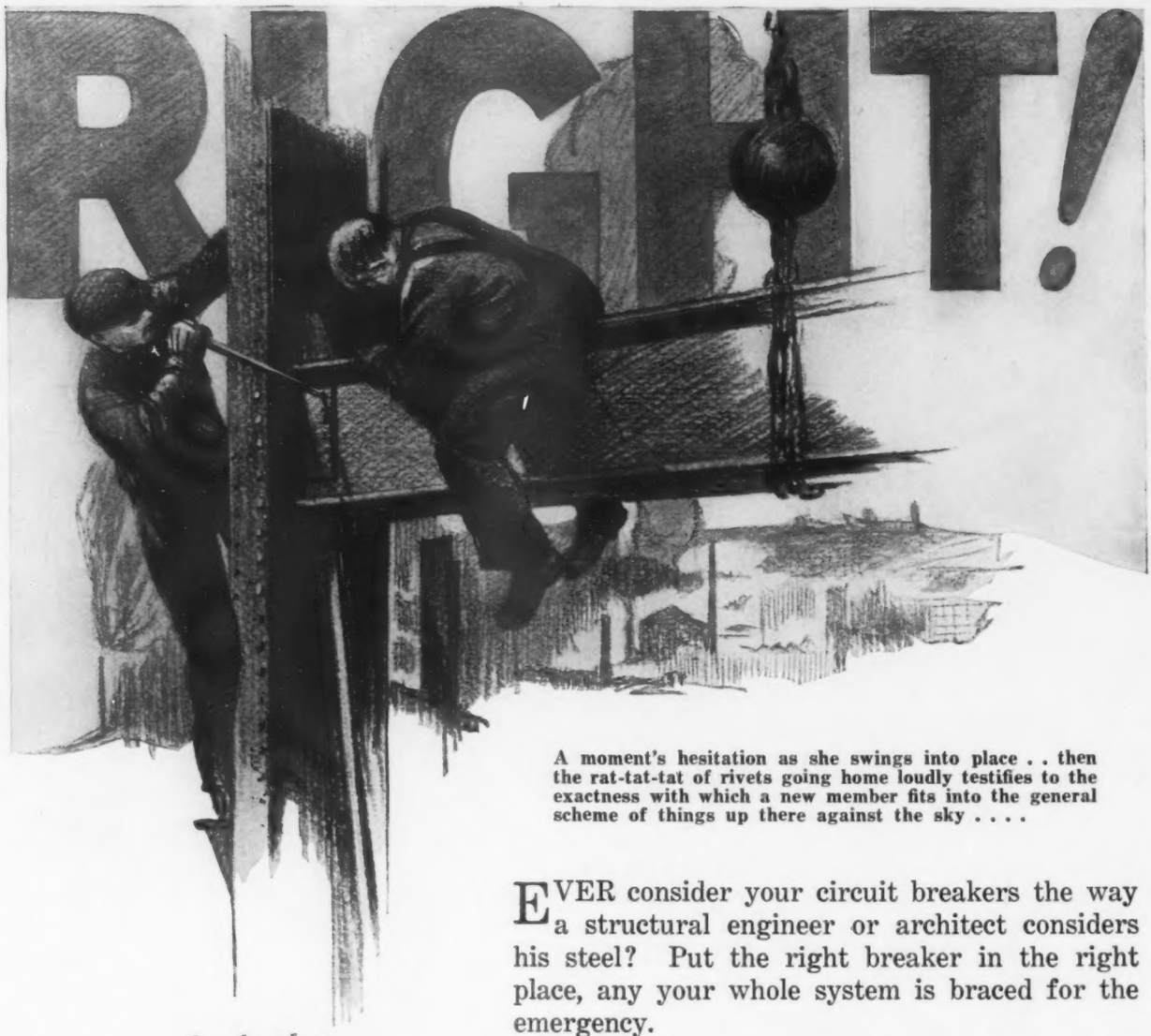

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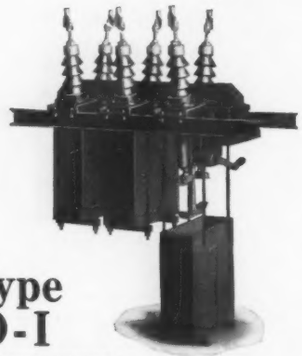

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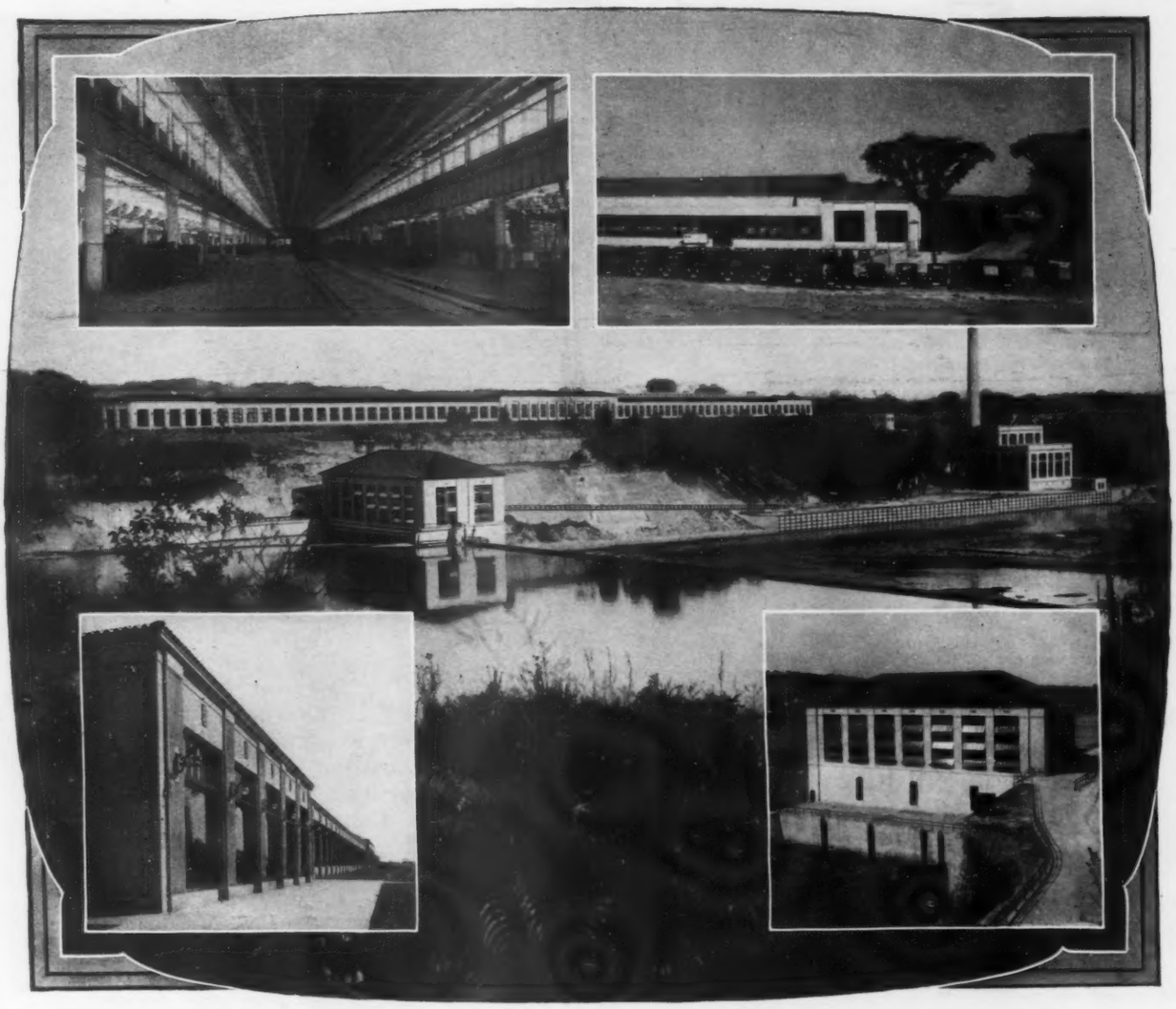
Inquiries from Fifteen States

SINCE the first announcement in the Journal of Electricity of the establishment of a department of correspondence instruction in public utilities at the University of Colorado by the Rocky Mountain Committee on Public Utility Information, inquiries have been received from no less than fifteen states, according to Prof. Elmore Peterson, head of the university extension division.

Both the university authorities and utility executives who are serving as members of the faculty in arranging and developing these courses express themselves as being not alone unusually gratified but also greatly surprised at the interest which already has been manifested through the original story appearing in the columns of the Journal.

Utility employees, engineering students, and others from every one of the eleven Western states have written to the university for information on these courses. Many letters have been directed also to the headquarters of the Rocky Mountain Committee in Denver, according to George E. Lewis, executive manager of the committee.

The purpose of the Journal of Electricity is to serve. To accomplish that purpose it works through many channels and in many different directions. The foregoing is but one instance of the kind of service it renders.



Ford Twin Cities Plant

IN this Ford manufacturing plant designed and built by Stone & Webster at St. Paul, Minnesota, the ground area of the single-story main building is nearly 20 acres* and the capacity of the power plants, one steam and one hydroelectric, on the Mississippi, is 25,000 horse power. Albert Kahn was Associate Architect on the main building.

Materials for manufacturing enter the main building and are unloaded direct from the railroad cars. It is planned to have the finished product descend by elevator 100 feet to a terminal chamber and go thence by tunnel 700 feet to a boat landing for shipment by water.

*The building is 1400 feet long by 600 feet wide

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EDITORIAL

Yakima Listens to the Siren Song

ANCIENT folk lore, notably in the story of Ulysses, tells of a certain rocky shore, peopied by maidens of surpassing beauty and seductive charm, where mariners seldom failed to meet with disaster. Lured by the sweet songs of the Sirens and their promises of a beautiful life of ease and enjoyment, devoid of all care, these mariners turned their ships landward, oblivious of the treacherous rocks, only to be crushed upon them and their ships destroyed, themselves drowned.

So often is this situation repeated in various forms that the siren song has become known as a voice fraught with danger. In the political-ownership seas, especially, is the siren voice seductive, and it is a rare community which has not heard it at some time or other.

Just recently the little city of Yakima, Wash., was treated to a solo from the municipal-ownership siren, and lo, is said to have heeded the call to the extent of recommending that she change her course toward the rocks of municipal business enterprise. The gentleman who sang the sweet song is said by press reports to have "described the low rates of a number of cities which own their own power plants. He cited Cleveland and Springfield, Ohio; Jamestown, N. Y.; Ontario, Canada; and Seattle and Tacoma, all of which manufacture their own electric current and sell it to their people at half or less than the people here are able to buy it——."

Like most siren songs, half-truths abound in its lyric phrases. The beauty of the maidens—low rates—is made the burden of the song. But nothing is ever said about the rocks. The rocks of cold fact are ugly and do not fit into a charming song, but unfortunately they do snag many a municipal craft.

One of the underlying weaknesses of human nature is to be found in the desire to believe only the good, the true, and the beautiful when occasion sometimes calls for a stern facing of facts. We cherish fairy stories long after we boast loudly that we no longer believe in such things. The only difference is that we are apt, as human beings grown up, to select new fairy stories of life in some of its economic aspects to believe in. A siren song of "untold benefits" to be derived from political ownership of anything is very appealing to the imagination. Close scrutiny, which would denude such appeals of their glamor and reveal the rocks of which to be wary, is rarely exercised in such cases simply because human nature so wants to believe its pretty fairy tales. That, too, is perhaps the reason why he who points a cold finger through the mist to the danger ahead is regarded as something akin to that terrible person who reveals to little children that there is no Santa Claus after all.

Storm Clouds of State Ownership Gathering Over Pacific Coast

BALBOA has been accused of having been uninformed when he named the ocean which laps the western shores of America the Pacific. He most assuredly was when the term is applied to the politics of those states adjacent to that body of water. Along with some of the soundest forms of legislation developed in this country has come some of the most bizarre and unsound ever to grace an election ballot. In this latter class fall those measures which have as their basis the theory that government should undertake the operation of such an intricate and technical business as the generation and distribution of electric energy. Yet notwithstanding the apparent fallacy and unsoundness of the proposals, in three elections during the past four years their proponents have been able to delude an increasing proportion of the voters into the belief that such a procedure has merit.

No "weather eye" is needed to see the storm clouds that are brewing over political camps in Oregon, Washington and California. Those utility executives who harbor the impression that the 1926 elections in these states will be without the biennial attacks on the light and power industry need but to listen closely to the political rumblings to have their sense of security at least shaken. California will have its Water and Power Act this year; Oregon already has its Grange Bill and Housewives Bill, both with the ordained purpose of placing the state in the power business; and Washington is threatened with some form of "free" power legislation.

The executive who feels that the movement on the Pacific Coast this year is not serious is laboring under a misapprehension. The danger of public ownership displacing private ownership will exist always, as it is the crux of the most persistent and vital issue that divides society today—the warfare between the socialistic and individualistic concept of the ideal social structure. For the next generation at least the public utilities will be the focal point of attack.

This year the protagonists of the measures find themselves strategically strengthened in their position to appeal emotionally to the prejudices and

fears of the public. Two popular misconceptions still will be the basis for the brunt of the attack. They are:

The belief that there is being given outright to the hydroelectric utilities for private exploitation natural resources of enormous value which should be retained by the people.

The belief that there is inherent danger to the public in a privately owned corporation, controlling great combinations of capital and the supply of an essential service—in other words, the instinctive fear of a great monopoly by the mass of people.

So far as the electric utilities are concerned there have been added to these two misconceptions two pronounced movements which will lend strength to the arguments of the proponents of this type of legislation. These movements are:

The unprecedented increase in the prices of the common stocks of the electric utilities which lately has taken place, with the implication on the part of many that excessive profits are being earned by those companies.

The development of the holding company, resulting in the concentration of large aggregations of capital and the rendition of electric service to great sections of the country by combinations of companies under a single financial control, thus giving alarm to those who fear a nation-wide "power trust."

On the surface it would appear that the case of the politically misguided few who foster legislation of this character has been strengthened materially. Those in the electric light and power industry know far better. Electricity is cheaper and service is better today than at any time in the history of the industry. And the trend is toward greater economies and lower cost to the public.

The problem of the industry is self-evident. Facts are available. Truth is truth. The task remains for these facts to be marshalled and presented to the mass of voters, who, it will be found, are an intelligent class, well able to think for themselves once they have been informed.

However, the task must not be delayed until a week or a month prior to election day. Work of organizing must begin immediately. Educational publicity must be started. The goal to be reached in November is such an overwhelming defeat to the various measures in those three states that their proponents will not dare again to initiate legislation assailing the light and power industry.

Approaching Sunlight as a Natural Limit

RATHER slow in its early development, the attention which has been focused on industrial lighting by the campaign just closed has begun to open up realizations of possibilities in this field before undreamed of. Cautiously feeling its way forward, this development of industrial illumination has been content with rather modest beginnings, but those in close touch with its possibilities now are pointing to even greater fields of sales effort which should yield results of a magnitude that shall dwarf today's finest achievements.

One man, an executive of one of the largest manufacturers of lighting equipment for industrial applications, draws attention to what he terms the modesty of present standards as regards what is considered adequate illumination of industrial plants.

A job which will give the industrial plant a foot-candle intensity of from 10 to 13 foot-candles, today is considered to be the peak of achievement, he points out, and yet, compared to the illumination of sunlight even on cloudy days, this is woefully low. On a cloudy day the ordinary street will have an intensity of as high as 1,000 foot-candles, he points out, while on sunny days the intensity ranges from 5,000 or 7,000 to 10,000 or more foot-candles. The contention which he rightly makes is that central stations and contractors selling industrial lighting should not be content with anything less than from 100 to 150 foot-candles as a standard for adequate industrial illumination.

While this increased standard at first glance might seem somewhat of a big step, he bears out his statement with the fact that reflector and diffusion equipment for the elimination of glare even now is available for such intensities and has been designed to give the even distribution of light which is considered desirable by all illuminating engineers.

It is obvious at once that such a standard would result in benefits not only to the central station serving an industrial lighting load of such demand, but to the contractor who would install such a heavy-duty system, the jobber and manufacturer of the equipment, and of course the customer himself. Without this complete cycle of benefit, naturally, the plan would not be feasible.

It would seem that once the industry has started on a program to supplement the light of the sun after that important luminary has ceased his labors for the day it would do well to do a good job of it. A maximum intensity of 13 foot-candles in such a light is very feeble imitation and rather an admission of impotence. To approach more nearly the intensity of sunlight itself is merely to place the industry on a dignified basis of genuine assistant and not merely apprentice in this task of lighting the earth.

DISCUSSION

City Engineer Comments on Hetch Hetchy Construction Cost

To the Editor:

Sir—I appreciate very much the courtesy extended to permit me to comment on the statements contained in the communication submitted to The Journal of Electricity by Mr. C. E. Grunsky on the

subject of "The Cost of Power from San Francisco's Municipal Plant."

Mr. Grunsky's letter no doubt was inspired by the action of the San Francisco Board of Supervisors in establishing a figure of $9,000,000 as the investment on which interest should be charged against the cost of power production by the Moccasin power plant, instead of $21,000,000 as recommended by my office. This action of the board was taken after it had been clearly pointed out that the effect would be to make the cost of power production apparently very low and, if adhered to, the cost of water correspondingly high.

The Raker Bill, under which the grant of rights of way were obtained from the federal government, provides that in determining the cost of power production for sale purposes, the charge to power shall include a fair proportion of the cost of lands, dams and conduits, and the city engineer's figure was based on a 50 per cent division of the cost of all elements used jointly for water and power.

The purpose of the advocates of this low power charge was not to make the power appear cheap, but to enable them to divert the power revenue from its legitimate application to the payment of bond interest and apply it to the construction of an extension of the transmission line from Newark to San Francisco, thereby necessitating the payment of that portion of the interest charges from taxation.

I am in full accord with Mr. Grunsky in his condemnation of this proceeding and if he had confined himself to a criticism of these low false charges, I would not have felt called upon to reply to his communication. However, he follows this with a rather extended criticism of the program of construction of the Hetch Hetchy project on what he terms a large scale power and water development. He points out correctly that there has been built an 18-mile tunnel through the mountains from Early Intake to Priest forebay, with a capacity of 400,000,000 gal. of water daily (actually 500,000,000), with a power station and transmission line, together with the necessary storage at Hetch Hetchy Valley and Lake Eleanor, and that some $6,000,000 has been invested in a conduit across the Santa Clara Valley to be used by the Spring Valley Water Company for the delivering of water caught in its Calaveras reservoir. He points out that the construction of these features of the project has exhausted the original bond fund of $45,000,000, leaving the tunnel in the Sierra Nevada foothills, the pipe line across the San Joaquin Valley, and some 30 miles of tunnel through the Coast Range yet to be constructed. Certain of these features, particularly the 30-mile tunnel through the Coast Range, he points out were not contemplated in what is known as the original Garfield permit, upon the basis of which the original bond issue was voted.

Mr. Grunsky as city engineer and Mr. Marsden Manson, his successor, were the authors of a plan to bring into San Francisco some 60,000,000 gallons of water daily from the upper Tuolumne, which development was originally estimated on the then current prices of labor and materials in 1908 to cost some $45,000,000 and for the construction of which a revocable permit was granted by Secretary Garfield in that same year. Mr. Grunsky in his letter infers that a mistake was made in not developing the project on the lines originally advocated by himself and Mr. Manson. Mr. Grunsky's statement is not fair to those who have been responsible for the development program followed. He does not bring out the fact that immediately after the $45,000,000 of bonds were voted in 1910, the Secretary of the Interior issued an order to show cause why this so-called Garfield permit should not be revoked and the city be required to develop some more available source of supply than the Tuolumne project. He does not bring out the fact that following this order to show cause the city was required to investigate and report on some fourteen or more different sources of supply, as to their availability, and that a board of United States Army engineers was appointed, which board, after reviewing all of these reports and making independent investigations, reported to the United States government authorities that the Hetch Hetchy project as now being developed was not only the most available but the cheapest source of water supply. This present plan was adopted on the recommendation of Mr. John R. Freeman, who made an intensive study of the entire project and in his report set forth fully the advantages to be derived from the development of this water supply on a large scale as against the 60,000,000-gallon development proposed by Mr. Grunsky.

Acting on the findings of this board of army engineers, who endorsed Mr. Freeman's report, Congress passed the Raker Bill, which made it compulsory for the City of San Francisco to develop the Hetch Hetchy Valley storage first by the construction of this dam to its present height and further required that electric power be developed in conjunction with the project, the first 10,000 hp. within three years and after the completion of any portion of the project suitable for the development of power, then in successive increments of 10,000 hp. until 60,000 hp. had been developed within twenty years.

Economical development of power under the provisions of the Raker Bill, as well as the protection of our water rights, dictated the construction of tunnels initially with capacity to carry the full amount of water required for the ultimate power development, and to carry the investment in the tunnel and dam it was essential, from an economic point of view, to construct the necessary power plant and transmission facilities and to utilize at the earliest date possible the full capacity of the tunnels so constructed, and our program of construction in the so-called Mountain Division has been completed along these lines. The net result is that approximately $38,000,000, proceeds of the bond issue, have been spent on the mountain division, including the power development and transmission line, of which approximately $21,000,000

is legitimately chargeable against power development, leaving $17,000,000 for the water development in the Mountain Division; and the city today is receiving a gross annual revenue of approximately $2,200,000, which after deducting expense of operation, maintenance and depreciation, leaves a net revenue of $1,825,000, which is more than sufficient to pay the bond interest on the entire bond expenditure in the Mountain Division.

Mr. Grunsky's letter, by inference, seems to find fault with the construction of the so-called Bay Crossing Division of the Hetch Hetchy conduit crossing the Santa Clara Valley from Irvington to Spring Valley reservoir, constructed at a cost of approximately $6,000,000.

He does not point out that if the city had not constructed this conduit it would have been necessary for the Spring Valley Water Company to have invested some $12,000,000 in a conduit which, under their plans, would have been constructed at a higher level and which would not have been available for San Francisco's Hetch Hetchy supply in the event of acquiring the Spring Valley Water Company. He does not point out that under the arrangements made with the Spring Valley Water Company they have paid the city for interest during construction and will pay $250,000 annually for the use of this conduit during a 10-year period, and that they have given to San Francisco an option during this period to purchase all the water-producing properties of the company, including 63,000 acres of land, at a figure of $38,000,000, a price established some years ago by the California State Railroad Commission as the value of the property. The completion of this conduit and the additional development of the Spring Valley company's storage facilities will have made available for San Francisco some 24,000,000 gallons of water additional and have averted what otherwise might have been a serious water famine, and has extended for some six years the time when Hetch Hetchy water must be delivered into San Francisco.

Surely neither the cost of the construction of this conduit nor the Foothill and Coast Range tunnels, nor the San Joaquin pipe line, can by any stretch of the imagination be charged against power development.

The following is a quotation from a statement made by Major General Biddle of the United States Army, who, with General Taylor and Colonel Cosby, formed the board of army engineers who reported on the project, after a trip over the work:

I am very glad to say that, after ten or eleven years since our work (army board) was done, existing conditions have proved that the findings of the board were right. I am also very glad to say, after a visit to the valley, which I have just made with Mr. O'Shaughnessy that what we dreaded somewhat, the destruction of the great natural beauties, was not justified, and that the lake of Hetch Hetchy is today one of the most beautiful spots in the Sierras.

The work at the dam is completed. The dam itself is a completed structure, and the tunnels and other structural work have, in a large part, been completed. I am not in a position, having no figures, to state exactly what the cost has been and how economically the work has been done. But from my general knowledge of engineering and my special knowledge of your chief engineer here, I feel absolutely certain that the work is first class. The work at Hetch Hetchy dam is a splendid monument to your engineer, which will last, I was going to say, for a thousand years to come—maybe two thousand. The work in the tunnels is equally good, so that I am sure the people here are going to have a great deal to be proud of each day for the manner in which this great engineering project is being carried out.

Of course, in all engineering work, especially tunnels, you find difficulties and unforeseen matters. Such things always have occurred and always will occur. It doesn't make any difference how much experience you have had, there is always something unexpected which adds to your cost. What your experience in that respect may have been, I don't know, but I do know and want to state without reserve, that, in my opinion, Hetch Hetchy is the best if not the only really available source of water supply for San Francisco and the bay cities, and especially for those cities as they shall be in the future and that the work that has been done is really a first-class job, in every respect, and that if you shall be fortunate enough to retain the services of Engineer O'Shaughnessy the remainder of the work will be equally well done.

Mr. John R. Freeman of Providence, Rhode Island:

December 17, 1925.

Mr. M. M. O'Shaughnessy, City Engineer,
San Francisco, California.

Dear Mr. O'Shaughnessy:

I thank you for remembering me with a copy of your very interesting report on the Hetch Hetchy project, bearing date of October 1925.

I am much interested to note that the income is paying interest on the cost of the investment to date.

Yours very truly,
(Signed) John R. Freeman.

Citizens of San Francisco are not worrying about the cost or the methods of construction, as witness the resolution passed by the members of the Chamber of Commerce who visited the works:

May 25, 1924.

First. That the work of constructing the remaining tunnels and pipe lines to bring the water into San Francisco should be undertaken and completed at the earliest date possible with due regard for efficiency and cost of construction.

Second. That His Honor, the Mayor, and the Board of Supervisors insist that, when the question of issuing bonds for the completion of the work is submitted to the people of San Francisco—through the ballot—the funds required to complete the water project, and the bonds required to handle the power project, be placed on the ballot separately and distinctly so that the voters of the city may have an opportunity to register their approval or disapproval of either, or both, propositions.

Third. That the Board of Supervisors of San Francisco officially extend an invitation to every San Franciscan to visit Hetch Hetchy; to go there and see for himself or herself the magnificent works that have been constructed, under the direction of Chief Engineer O'Shaughnessy; to determine whether the work has been necessary and whether it has been well done; and whether in his or her opinion it is advisable to complete the work and bring Hetch Hetchy water into San Francisco with as little delay as possible. The cost to the individual of this very wonderful and educational trip to one of the most beautiful spots in California is very modest, namely, about $30, and is well worth while.

It is pertinent to say that by unanimous vote every person present assured Chief Engineer O'Shaughnessy of his admiration for his ability as a great engineer and his confidence in his integrity as a man, and expressed the hope that he would be spared to serve San Francisco in the future in the same loyal and unselfish manner as in the past, to the end that this great project for giving San Francisco an unlimited supply of pure, fresh water be carried to fruition under his guidance and in accordance with his plans.

Attached hereto is a list of the San Francisco visitors

to the Hetch Hetchy Project, who were present at the dinner at Cavagnaro Station, Sunday evening, May 25th, all of whom endorsed the above recommendation and authorized that this statement be made to the public of San Francisco in their name.

Yours very truly,
(Signed) Geo. M. Rolph,
Chairman.

It is regrettable that Mr. Grunsky should see fit at this date to raise these questions on the wisdom of a policy of construction which had been adopted some twelve years ago, following the most exhaustive reports of the most eminent engineers in the United States, which can serve no other purpose than to befog the public mind and tend to shake the confidence of the public in the value of this great project, especially where no constructive ideas are advanced by him for the completion of the project.

Fortunately many of the people of San Francisco have availed themselves of the opportunity of visiting the project and have seen for themselves the completed elements of the project as General Biddle has done, and they have not been misled by the direful prophecies of the calamity howlers, as is evidenced by their recently going on record by a vote of 20 to 1, for a $10,000,000 bond issue for a continuance of the construction work, and this with a full knowledge that within a few years they will again be called upon for another bond issue of $25,000,000 and later for $38,000,000 to purchase the Spring Valley properties.

I enclose herewith a statement of expenditures on the project as recently published, which may be contrasted with Mr. Grunsky's $60,000,000 figure; also a statement of revenue and operating expenses of the Moccasin power plant to Jan. 1, 1926.

Thanking you again for the opportunity to clear up the false impressions given by Mr. Grunsky's letter, I am

M. M. O'Shaughnessy,
City Engineer.

San Francisco, Calif., March 20, 1926.

ESTIMATED COSTS OF VARIOUS DIVISIONS OF THE WORK

Financed from Bond Issue of 1909 and 1910, and General Fund expenditures previous to 1909.

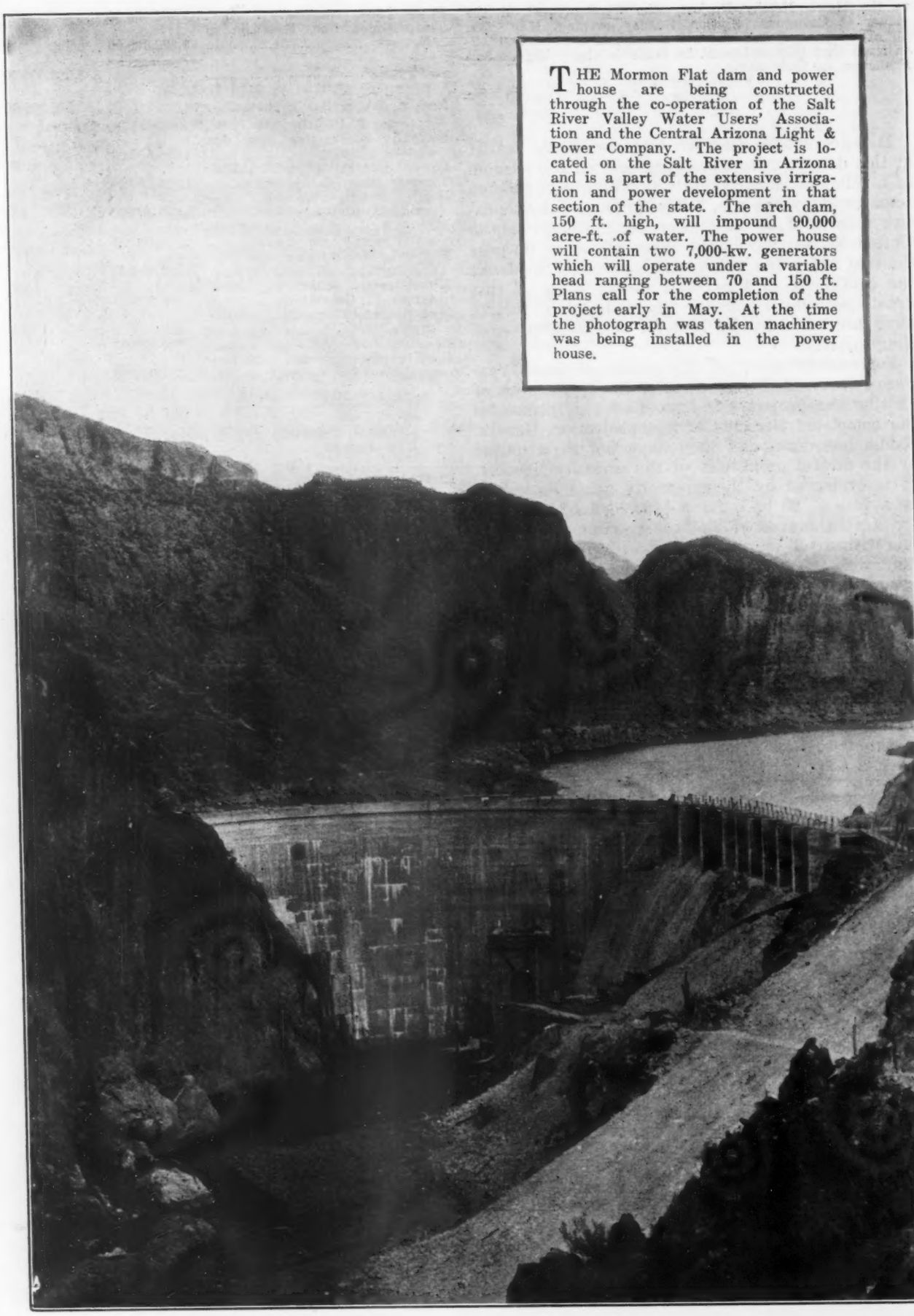
MOUNTAIN DEVELOPMENT

Hetch Hetchy Division		
O'Shaughnessy dam, clearing of Hetch Hetchy reservoir		$ 7,400,000.00
Eleanor Division		
Eleanor dam, clearing of Lake Eleanor reservoir		373,000.00
Mountain Division		
Early Intake diversion dam and spillway and headworks of aqueduct	$ 610,000.00	
Aqueduct tunnels and appurtenances, Early Intake to Priest reservoir (18.84 miles)	10,100,000.00	
Total		10,710,000.00
Moccasin Division		
Priest dam and reservoir	$ 930,000.00	
Moccasin tunnel, from Priest reservoir to head of penstock lines	1,200,000.00	
Penstock lines	2,000,000.00	
Power house building, dwellings, school, etc.	1,200,000.00	
Power house machinery	1,135,000.00	
Transmission line, Moccasin to Newark	1,623,000.00	
Total		$ 8,088,000.00
Foothill Division		
Red Mountain Bar Siphon		262,000.00
General, Utilities, Etc., on Mountain Development		
Sawmill construction and operation	$ 556,000.00	
Lower Cherry power system, construction and operation	1,079,000.00	
Hetch Hetchy railroad, construction and operation	5,379,000.00	
Munn sand plant, Groveland water supply, etc.	77,000.00	
Hospital, construction and operation	221,000.00	
Miscellaneous structures, water supply at Groveland	196,000.00	
Miscellaneous roads, trails, camps, etc.	369,000.00	
Boarding house loss	360,000.00	
Field engineering and administration	381,000.00	
Total		8,618,000.00
Total Mountain Development		$35,451,000.00
Bay Development		
Riveted steel pipe line, 60 inches diameter	$ 2,408,000.00	
Trestle for steel pipe line	198,000.00	
Submarine pipe lines	599,000.00	
Steel bridge and piers	1,560,000.00	
Gate valves, bay Pulgas pumps, etc.	39,000.00	
Pulgas Tunnel	757,000.00	
Field engineering and administration	93,000.00	
City office engineering and administration	42,000.00	
Total		5,696,000.00
General		
Administration, engineering, legal, etc.	$ 1,415,000.00	
Reservoir and watershed lands, water rights, rights of way, payments to U. S. government, etc.	2,020,000.00	
Lands and rights of way, San Joaquin Division	215,000.00	
Lands and rights of way, transmission line	117,000.00	
Lands and rights of way, Bay Development	221,000.00	
Miscellaneous	322,000.00	
Total		4,310,000.00
Total Expenditures		$45,457,000.00
Less credit for receipts from operation of Hetch Hetchy railroad, Lower Cherry power system, lumber sales, etc.		1,907,000.00
Net total expenditures after deducting credits, which may be still further reduced on final accounting by salvage value of equipment now on hand		$43,550,000.00

MOCCASIN POWER REVENUE AND OPERATING EXPENSE

By Months
From Aug. 16 to Dec. 31, 1925

Month	Gross Revenue	Operating Expense	Net Revenue
Aug. (15 days)	$ 88,555.87	$ 6,695.80	$ 81,860.07
Sept.	182,426.98	13,399.48	169,027.50
Oct.	204,905.46	20,131.74	184,773.72
Nov.	186,070.22	19,614.02	166,456.20
Dec.	196,663.35	18,954.44	177,708.91
Total, 4½ mos.	$858,621.88	$ 78,795.48	$779,826.40



THE Mormon Flat dam and power house are being constructed through the co-operation of the Salt River Valley Water Users' Association and the Central Arizona Light & Power Company. The project is located on the Salt River in Arizona and is a part of the extensive irrigation and power development in that section of the state. The arch dam, 150 ft. high, will impound 90,000 acre-ft. of water. The power house will contain two 7,000-kw. generators which will operate under a variable head ranging between 70 and 150 ft. Plans call for the completion of the project early in May. At the time the photograph was taken machinery was being installed in the power house.

Edison Goal for 1926 Is 200,000 Hp. of New Business

By A. W. Childs
General Sales Manager, Southern California Edison Company, Los Angeles

CO-OPERATIVE program of the Southern California Edison Company calls for sale of 3,000 electric ranges, 1,600 water heaters, 2,200 refrigerators, and 20,000 miscellaneous appliances. Dealers and contractors are to benefit to the fullest extent from this constructive program, which includes the formation of an acceptance corporation to handle time-payment paper.

WTH a merchandising plan designed to have a constructive and stimulating effect upon appliance sales as a whole in the territory served and to give greatest possible assistance to the dealer, the Southern California Edison Company expects to add 200,000 hp. of new business to its lines during 1926. The company's plans call for the division of this total load as follows: domestic and commercial lighting, 55,000 hp.; cooking and heating, 40,000 hp.; power, 105,000 hp. In terms of appliances the minimum sales expected for the current year are 3,000 electric ranges, 1,600 electric water heaters, 2,200 refrigerators and 20,000 miscellaneous small appliances.

The Edison company's merchandising program is based upon several fundamental principles. Its officials believe that there are two paramount reasons why the sale of appliances should be conducted on a merchandising basis. The first reason is that the power company should co-operate with the dealer and not engage in unprofitable ventures. The second is that there should be a margin of profit sufficient to cover fully the actual selling expenses of the merchandise distributed because it might be said that a part of the burden of selling the appliances to some consumers had to be borne by other consumers not interested in the sale of these devices. The Edison company's program calls for the working with and co-operating in every way with the dealer and contractor.

Furthermore, it is the company's belief that in order that the public may receive all the benefits to be derived from electric services there must be many ways for the consumer to obtain those electric appliances which lighten labor and bring joy to homes. The more channels available, the sooner, will the public be benefited. The contractor-dealer has opportunities which are peculiar to his business, and the power companies should realize that assistance given the dealer will benefit all concerned. Moreover, the more such appliances and devices are sold, the more work there will be for the contractor-dealer in the installation of wiring, fixtures and other material to enable the appliances to be put into service.

The company also believes that for the larger appliances such as ranges, water heaters, washers, refrigerators and devices requiring technical skill servicing by the central-station company is necessary. A power company should have competent men for this work. The consumer should be saved needless delay and the cost of servicing should be kept down to a minimum.

In its desire to keep well abreast of the times and of the requirements of the electrical industry, the Edison company has become affiliated with an acceptance corporation as a part of its commercial program for the purpose of handling time-payment paper, both for the company and all electrical dealers in its territory. The company feels that this connection should be beneficial not only to consumers but to all branches of the industry interested in the manufacture, distribution and sale of current-consuming devices. This plan will be of great advantage to the progressive dealer whose capital is limited. If he sells an electric refrigerator, he retains the down cash payment and then may turn over his contract covering the deferred payments to the acceptance corporation and receive from it the balance of the purchase price. This enables the dealer to make the sale, obtain the full profit on the appliance sold, keep his capital employed in active stock and relieve him from the expense and trouble of collecting the deferred installment payments. The dealer's responsibility in connection with the sale is not ended until the customer makes the final payment upon the appliance purchased. The acceptance corporation will handle time-payment contracts on ranges, water heaters, refrigerators, washing machines and vacuum cleaners where the sales price is $50 or more.

The Edison company's own merchandising program is divided into two parts. The first covers the sale of heavy-duty appliances, such as ranges, water heaters and refrigerators. These appliances will be on display in all of the company's sixty-four district offices and sub-offices. Sales will be made by an organized staff of fifty trained men in the field and twenty saleswomen in the offices.

The Modern Method of Refrigeration is now practical fo
every home using Edison Service

Use
Electrical
Refrigeration

CLEAN·ECONOMICAL·CERTAIN

THE Southern California Edison Company makes available a complete line of electrical refrigerators which are thoroughly tested and backed by the Edison assurance of satisfactory service. They are on display in every Edison office. Even if you do not contemplate an immediate purchase it will pay you to see Busy Buttons' latest contribution to the home, to observe the many things that it will do and learn how easy it is to secure one.

THE SAME fine refrigerators which are used so successfully in markets and shops—hotels and clubs—are now made in smaller sizes especially suitable for California homes. Any home with electric lights may have this new convenience which before long will be considered a real necessity.

Not a Substitute for Ice, but an Improved Method of Refrigerating

The vacuum cleaner is not a substitute for the broom, nor the automobile for the horse. These modern devices are vastly superior to old-fashioned methods. The same is true of the electrical refrigerator.

Cleanliness Never Before Possible

The distinctive feature about electrical refrigeration is that it is DRY. And a dry refrigerator is clean.

Food Remains Fresh

In a constant, low temperature food keeps fresh much longer than in a varying temperature.

Many Foods Actually Improve...

Meat that has been thoroughly chilled is more tender and has a finer flavor. Lettuce, celery and fruit from the electrical refrigerator make better salads.

Nothing to Watch... Not Even a Switch to Remember...

All that is necessary is a light socket or a convenience outlet.

Power turns on and off automatically as temperature rises and drops. "Install it and forget it."

And Notice Cost is Low

Edison experts have investigated reports of several thousand homes throughout America where Electrical Refrigerators are used. In nearly every case the cost of operation is less than the cost of ice.

You'll be proud to own this modern household delight

The Electric Refrigerator is thoroughly constructed, bright, clean, shiny appliance which you would cherish for its beauty alone. Your friends will admire it, and you will be happy.

Every Home
Should Have a Washer
and an Ironer

There are two appliances which have taken most of the drudgery out of housework.

$10 Down

will put one in your home.

The balance can be paid while you are enjoying the use of the machine.

Thor
ELECTRIC
WASHERS & IRONERS

Either the washer or the ironer will be demonstrated for you at our office.

Both carry the Edison guarantee as well as that of the manufacturer.

Southern California
Edison Company

"Come and Get It..."
This TOASTER for MARCH only.... $4.75

THIS Manning-Bowman "Meteor" TURN-OVER Toaster at a price that will appeal to the economical housewife. Fully guaranteed for one year at the cash and carry price of $4.75.

SOUTHERN CALIFORNIA EDISON COMPANY

Electrical Refrigeration
for your home..

"Busy Buttons does it all"

what is it?
what will it do?
what is the method?
what does it cost?

These are the questions which everyone is asking about domestic *electrical refrigeration*--the new method for keeping food sweet, cold, clean and dry. We cannot tell the whole story in this space but here are the answers to the above questions.

What it is.. *Refrigeration without ice.* That is the story in three words. When you put this modern device in your house and turn on the current, *you* are through. Electricity does the rest. It is automatic. It looks like a refrigerator--it is a refrigerator--but it requires no ice.

What it does.. The electrical refrigerator is a complete unit. By electric power it *makes cold*--as low as 18° in the cold chamber and ranging from 40° to 50° in the food compartments. These temperatures are *constant*. It makes cubes of ice for table use. It makes ices. It makes sherbets. It makes frozen puddings. *It gives complete refrigeration.*

What the method is.. The instructions for operating an electrical refrigerator are simple and amusing. They consist of three words, "Leave it alone". Just turn on the current--the rest is automatic. Go away for a week--or a month, the box will be cold, sweet and dry when you return.

What it costs.. Probably less than you have been paying for ice. This is our conclusion after investigating the reports on several thousand installations thoughout America.

For complete information, inquire of your dealer or the nearest office of

SOUTHERN CALIFORNIA
EDISON COMPANY
Owned by those it Serves

Isn't it Sn
these Mor...gs?

An electric heater in the bed-room and another in the bath room will quickly take the chill off the air.

NO FUMES - - NO FLAME
CONVENIENT - PORTABLE
Ideal for Baby's Bath

This is the Edison heater, (made by Hotpoint.) Copper reflector, removable wire guard, ornamental base, adjustable to any angle--complete with cord and plug to fit any socket. This is an unusual value at

$6.50

Also a smaller size at $5.00

SOUTHERN CALIFORNIA
EDISON COMPANY
Owned by those it Serves

TOAST!

THIS is Electric Toaster month, and we are making a special effort to let everybody in on the benefits of electric toast.

Once you have eaten toast made on this fine Electric Toaster you will feel that breakfast is never complete without your toast.

Toast can be made right at the table and eaten while still warm and delicious.

Special Prices for March

Each month the electrical dealers in this territory feature some special item. This is your opportunity to get a standard toaster at a distinct saving.

AT YOUR ELECTRIC DEALER'S
or
Southern California
Edison Company
Owned by those it Serves

Special for
JANUARY

THIS splendid Edison heater [made by HOTPOINT] will be featured in all of our Offices as a January Special at $5.95 CASH AND CARRY

SOUTHERN CALIFORNIA EDISON COMPANY

Electric IRON $3.75
Special for FEBRUARY *only*

STANDARD 6-pound Edison Iron (made by Hotpoint). We are specially able to offer this special cash-and-carry bargain to our customers at this remarkably low price.

Southern California Edison Company

Samples of the various advertising being used by the Southern California Edison Company to promote the use of electric appliances in its territory. The samples show broadsides, bill stuffers and newspaper advertisements.

All types of appliances in this class will be sold at manufacturer's list price. Time payments will be handled on a basis of six, twelve and eighteen months on ranges, water heaters and refrigerators.

In connection with its refrigerator merchandising the company will sell completely equipped cabinets only. If a purchaser wishes to install a refrigerator unit in an old ice box the sale will be turned over to a dealer. An attractive plan has been worked out whereby contractor-builders engaged in the construction of groups of homes or apartment houses will be able to purchase refrigerators on a discount basis, discounts allowed being the same as those allowed by other refrigerator distributors. Discounts will depend upon the number of refrigerators purchased and will be determined on the last machine purchased, just as lamp and other quantity purchases are arranged. This plan is working successfully already and a number of blocks of machines have been sold to contractor-builders for installation in new homes.

As a preferred list of refrigerator prospects the company has its electric-range consumers upon whom sales attention is being concentrated on account of the low rate they will enjoy for this class of service. Of three sales letters regarding refrigerators that are being sent out, one which is directed primarily to those consumers who enjoy combination lighting, cooking and heating rates follows:

Mrs. J. D. Speer,
Pomona, California.
Dear Mrs. Speer:

Electricity, which has done so much to make housekeeping a delight, is now ready to go further and take care of all of your refrigeration requirements.

An electrical refrigerator—clean, sweet, and positively cold—working automatically—is more than a substitute for ice. It gives you that perfect refrigeration which you have observed in high-grade shops and markets.

Best of all, the cost of operation is low. In any case the electric bill will probably be less than has been paid for ice. Under the special rate you enjoy with your electric range, the cost for electrical refrigeration will be practically nominal.

Our representative will call in a few days and we are sure you will be interested in what he has to say.

Very truly yours,
District Manager.

To educate the housewife in the advantages of electric cookery, fourteen cooking schools will be conducted in the company's territory. These schools are fostered through the co-operative efforts of the local newspaper, the central station and the Edison Electric Appliance Company. They are designed to sell the housewife not only the advantages of the electric range but also of the electric refrigerator, vacuum cleaner, washing machine and ironer as well.

Two highly successful cooking schools already have been held. At Santa Paula, in co-operation with the "Santa Paula Chronicle," a school was held from Feb. 16-19 at which 950 women attended and 60 participated in the baking contest, in which prizes consisting of an electric range, an ironer, a vacuum cleaner and small appliances were given. At Redlands between March 2 and 5 a total of 1,615 women attended a cooking school and 325 participated in the baking contest.

Merchandising Small Appliances

In co-operation with the electrical jobbers and dealers in its territory the Edison company has worked out a plan of merchandising one small appliance each month. Consumers are offered an appliance at a special price for a period of one month, during which time a large amount of advertising is done both by the Edison company and the jobbers. Dealers participate in the campaign on the same basis as the power company. The plan was worked out after careful study by company officials, the jobbers and the merchandising committee of the Southern Division of the California Electragists. The program for the first half of the year follows:

January	Air heaters
February	Irons
March	Toasters
April	Percolators
May	Table stoves
June	Waffle irons
July and August	Ranges

The committee in charge of these special campaigns adopted waffle irons for June because it was of the opinion that a waffle iron makes an ideal gift for the June bride. In the case of ranges no special price will be made to the consumer although it is possible that ranges will be offered at exceptionally advantageous terms. It is hoped that by concentrating on ranges for two months considerable encouragement can be given to the dealers to merchandise this appliance.

After July it is hoped that the plans of the merchandising committee of the N.E.L.A. will be announced so that the sales activities in southern California can be tied in with them. If not, it is possible that some of the items featured during the first half of the year will again be made the subject of special campaigns in the fall.

Advertising and Publicity

The advertising program which will be used to stimulate public interest in the appliances being offered by the Edison company consists of newspaper advertisements, broadsides, bill stuffers and sales letters. Two special refrigerator broadsides will be used. At the present time 200,000 bill stuffers are being sent out monthly. General appliance advertising will tie in with the electrical dealers in the territory by saying, "See your local dealer," thus aiding dealers as well as the company. The advertising appropriation will be spent in 165 newspapers. All classes of advertising reach a considerable sum of money.

The Edison company's entire merchandising program has been designed to have a constructive and stimulating effect and at the same time to assist the electrical dealer to the greatest possible extent. Load-building is its foremost aim. The plan has been in effect sufficiently long to demonstrate the wisdom of the policy adopted, and a big load-building year throughout its territory is expected by the company.

Relation of Public Service Men to Public

By Franklin T. Griffith*
President, Portland Electric Power Company, Portland

MR. GRIFFITH recently in Seattle gave the engineers of the Northwest something to think about. Because of its inspirational character, because it presents so forcibly a number of subjects of interest over our entire territory, his address will find a welcome reception from a great number of our readers. Through the courtesy of Mr. Griffith and the Technical Section of the Northwest Electric Light and Power Association, we are able to present it herewith.

THE relation of public-service men to the public should be a most intimate one. It should be based upon the proper conception of the element "service" involved in our business. Employees generally, those engaged in public service in whatever capacity, as I see the picture, should realize that we are, in the truest and perhaps one of the highest senses, public servants. That conception should be thoroughly impressed upon every man and woman in the public-utility game. It should never be lost sight of for a single moment that our job is to do everything we can for the people we serve, because by serving the people we succeed or we fail. There is no such thing as going backwards in this business; it is not like some other branches of public service with which I am familiar, which may pause for a period of time and then may gain headway again, or fail entirely. In this industry we are going ahead steadily by tremendous leaps, and if we progress as we all believe and hope we should, we must not lose sight of the fact that our growth, our success, depends, even to a greater degree than on the efficiency technical men may bring into our affairs, upon that most powerful thing, the good will and the confidence of the people.

The Catch-Phrase Evil

Perhaps no statement true or false ever had a more disastrous effect on the public service of this country than the one allegedly uttered many years ago, "The public be damned!" How many times have you—and many of you are younger than others of us—in your short lives heard that expression referred to? Even to this day there are a great many that believe that expression typifies the attitude of this industry toward the public. You men, your executives, your accounting men, I hope, realize that one of the great problems of public service today is to disabuse the public mind of the evil effects of that phrase, which, I believe, Cornelius Vanderbilt never uttered. We must devote our time, our thoughts, our energies, in building up the respect and the confidence of the public in our industry.

We have made some headway in this direction through our customer-ownership activities, which are producing a true public ownership. Public ownership does not mean simply getting the money of the people invested in the corporation. It means trying to make each stockholder a real participant in our business. It means trying to get over to him the conception we have, making him understand and believe we have it in our hearts to conduct an honest business in an honest and efficient way. That is one of the great problems of this particular group of men. Advantage must be taken of every advance in the progress of the art, using it to better the service we render to the customer and the owner. That is your job, and you must not lose sight of it for a moment.

Government Ownership

One of the things facing us today, perhaps that which is of the greatest importance in its effect on the future, is the spread of popular sentiment in favor of government ownership.

Sentiment for government ownership, or municipal ownership, does not exist with anything like the same enthusiasm in those districts where power is produced by steam as in those where water power is abundant. There is something about hydroelectric power that appeals to the imagination. Those who believe in the desirability of government ownership either because they are honestly convinced or because they think there is something in the way of personal advantage to be obtained, seize this opportunity to appeal to the imagination of the uninformed. They talk about the great hydroelectric possibilities of this great West—and out here we do have these potential powers in far greater profusion than anywhere else. They say, "This great gift of free power is yours. Do not let the grasping hands of the powers of monopoly take from you that which is God-given to all, that which should be worked for all and served to the people at cost without profit to any one."

That makes a nice appeal to the man who thinks water power is something to be created out of nothing, that is, that it is cheap—and these proponents constantly talk about the cheap power

*Excerpts from an address before the third annual general meeting of the Technical Section, Northwest Electric Light and Power Association, Seattle, March 11-12, 1926.

to be derived from the development of the great resources of the West.

Cheap Power and Industry

I read every day or so in the newspapers some article upon the development of power by the people and for the people. I read the other day the claim that cheap power when developed here in the West would bring in its wake the greatest industrial development ever known or conceived by man. All that we need is power developed by the state or the municipalities to bring all the great industrial men and the great industries of the East out here to use that cheap power.

In this same article illustration was made of what has happened in Los Angeles, citing that in 1890 it had a population of 62,000 and Portland had 90,000, while today it has three or four times the population of Portland. Much of that great growth was attributed to the fact that Los Angeles had cheap power because the city has engaged in the power business and has made available the blessing that God had given the city to all who chose to come and locate there. The article made a great point of the fact that the residents of Los Angeles can get their energy at 5.6 cents per kw-hr., while the manufacturer, under certain conditions, may get it as low as 3/5 of a cent per kw-hr., pointing to this cheap power as being the mainspring of the industrial development of that city. That was the claim made, and yet in Seattle and in Portland, and in fact in many cities in these Northwest states of ours, energy can be, and is being, purchased and used by all the people at rates lower than those given in Los Angeles.

Los Angeles—Portland—Tacoma

What are the facts about these rates? Take the situation in Portland—and you have similar rates also right here in Washington—we have a rate in Portland which compares favorably with the 3/5-of-a-cent rate in Los Angeles. Any customer in Portland who wants to use 4,000 hp. may buy it on an annual basis at twenty-seven dollars per horsepower-year. That is about four mills, or 2/5 of a cent per kw.-hr., one-third lower than the rate quoted as being the mainspring of industrial development in the city of Los Angeles.

There is a municipal plant in Tacoma, perhaps one of the earliest, most successful and best managed municipal plants that we know about. It furnishes power at very low rates and yet what has been the industrial development of Tacoma in all the years it has supplied this cheap power? The fact is that Tacoma has shown less growth, proportionately, than any other city in the Northwest in the last twenty years. I cite that for the purpose of showing that this talk about cheap power bringing industry to a community is false, and that cheap power is not the mainspring of industrial development. It does not bring industry. It is an element to be considered in the establishment of any new industry, that is true, but it is not an important element in many industrial plants.

How many of you know the results of the governments census investigation of power? As long as ten years ago rates were at least ten per cent, on an average, higher than they are today, yet the cost of energy represented less than two per cent of the cost of manufactured products of 114,000 establishments in these United States. How large an element is that in determining the location of an industry? This talk of cheap rates bringing industrial development is all thin air!

Other elements are far more important. The availability of labor supply, the cost of labor, the market for the finished product, the availability of the raw materials to be used, the tax question—any of these is of far greater importance in the location of industry than the cost of power. Continuity of supply of energy is far more important than the cost of that energy. What the manufacturer wants to know is that his wheels will not stop because of a shortage of power. He wants to know that there is a supply of good service that will continue, and that that element may be forgotten as far as he is concerned, once his equipment is installed. I submit that under public service as conducted by private ownership there is that continuity of service, which ough to be far more satisfactory to any user of power than any service political management can render.

State Power Proposals in Oregon

We have in Oregon a fight more serious than that in Washington last year—more serious than that fought twice in California—because the two proposed measures our people are being called upon to consider are more drastic. For the benefit of my Oregon friends perhaps more than the rest of you—and yet, if you others are not familiar with the situation, I think it would be interesting to you as members of this great public service industry to acquaint yourself with it—I want to tell you about the two bills proposed there. Washington had one fight and won it, but it will have others. I am not speaking pessimistically; I do not fear the outcome; but I believe that forewarned is forearmed, and many of the arguments and answers are common to the situation as it might develop in any state or any locality.

The "Housewives" Bill

Portland has an organization called the "Housewives' Council." Housewife Dan Kelleher, Housewife George Joseph, and others compose this organization, and these housewives in pants have drawn measures for which they are now obtaining signatures from the people of Oregon for the purpose of placing them on the ballot at the November election.

Their bill provides, roughly and generally: That a commission consisting of housewives Dan Kelleher, Waldo Anderson, Kate Bonham, and two others shall be created and called the "Hydroelectric Commission of Oregon"; that this body with all its wealth of experience and knowledge of the business and its wonderful ability to grasp financial problems of great magnitude, shall have the power,

without veto anywhere, without control by any person, body or other organization, to bond the State of Oregon, obligating the full faith and credit of the state up to five per cent of its assessed valuation, which, under the present valuation, would be about fifty-five million dollars; that they may use the money so raised for the purpose of developing the latent industry of the state, consisting of hydroelectric power; that, in addition to this power to issue general obligation bonds, they may issue public utilities' certificates without limitation whatever as to the amount, using such certificates for the purpose of acquiring by construction, purchase, or otherwise, any utility or new plants they wish; and that they may do almost anything they deem necessary to carry out the purposes of this act.

With these powers they might condemn the property I represent, if they so desired. They might mortgage it for such an amount as it would be reasonable security for, such mortgage, or the bonds issued therefor, being secured only by the property. They might say fifty or seventy-five per cent of the cost of condemnation or purchase is to be financed by utilities' certificates—and they have that power—and the balance of the money necessary to condemn or acquire could be covered by issuance of bonds of the State of Oregon pledging the credit of the state up to fifty-five million dollars.

They may, under this bill—this same group of housewives—withdraw from entry every drop of water not now developed in the State of Oregon. They may make such developments, where, as, if or when they please; they may acquire, if the law is upheld—and there is some question about that from a legal standpoint—a portion of any existing system, if necessary to complete such plans as they have in mind for development of their own scheme. Now this power will be vested in this group of housewives. They serve without compensation, purely for the love of it, but they have the power to create boards of their own choice, employ whom they please and fix compensation for the positions on such boards. There is no limit to the power they ask, and it may be seen that it is one of the most drastic measures for the expulsion of private ownership and the creation of new indebtedness ever conceived by man and imposed on an intelligent public.

The Grange Bill

Such is one of the bills we have to fight. The other is fostered by the state grange, of which our governor is a member. The grange believes our farmers have not had proper treatment; believes there is truth in the doctrine preached by Carl Thompson and others, who have advanced fallacious theories of public service. It believes that if the state goes into the power business the farmers will get their energy at half the cost now being paid; that they will heat and light their homes electrically, operate all of their equipment electrically; and that they will get this energy at such low cost it will mean nothing to them.

The grange proposes that before the state engages in this business there must be a constitutional amendment authorizing the state to do so, and it proposes a well-drawn amendment giving the state that power. In order to make that amendment effective, if adopted by the people, it proposes a bill similar in character to that proposed by the housewives, with this exception: that the power to bond the state is limited to four per cent on the grange bill against five per cent on the housewives' bill, and the members of the commission, with the exception of the state engineer, shall be appointed by the governor and continue in office until removed by the governor. There is one other provision in the grange bill not in the housewives' bill, and that was inserted rather cleverly, that all property acquired under the bill shall be subject to taxation. Thus will be met the argument that public service property pays taxes and supports the government; it will be contended that if the state engages in the business it will not add taxes to the present burden. This provision was put in the bill for the sole purpose of meeting objections from the power interests.

Now I ask you, gentlemen, as members of this great fraternity of ours: Do you conceive any obligation resting upon yourselves, individually as well as collectively, to combat such policies? If you do not believe in the business you are engaged in, get out of it! If you do not have confidence in the company you are employed by, leave its employ! If you are true and loyal to the cause you represent, you will conceive you have a definite obligation resting upon each and every one of you to remove the misapprehension of the people as to the facts; you will combat these policies as a social matter, as a matter of political economy, as a matter of differentiating between communism and republicanism.

Inspiration in the Hope of Reward

There are two great powers in this world, two of the greatest powers governing the behavior of men: first the fear of punishment; second, the hope of reward. Take from society those two great powers and you have an unleavened mass.

Where have you found anywhere, anything other than a plain level of operation under government service, or government ownership? True, you do find the occasional man standing out by himself, who, by reason of a high sense of obligation to public duty, undertakes operation of public enterprise. The rule in private ownership is that every man is striving, selfishly, if you please, realizing that by his own initiative, ambition and energy, he will climb farther and farther up the ladder of success, and be rewarded in proportion. It is this selfish motive that has made America industrially great.

The Example of Ontario

In this campaign in Oregon many, many times, you'll have thrown at you the example of Ontario. You hear of this wonderful experiment of the Hydroelectric Commission of Ontario, touted as a shining illustration of the possibilities of successful

operation of governmentally owned enterprises. Now is it? Is it that, or is it something entirely different? If you believe one branch of the public press lacking knowledge of the innermost facts concerning it, you will say it is a successful experiment. It is true that in many places in Ontario the rates for domestic service are lower than on the American side of the line. The contrary is true also that in seventy-four of the communities the rates are higher for domestic service than in any place in Oregon, Washington or California. The rates are not uniform. On a general average the rates for power are greater than on the American side of the line for similar load.

Two hundred forty million dollars of the Ontario Province money has been spent on this great project, and they say they pay taxes on this property. They pay taxes on ten million of that two hundred forty million dollars, and this furnishes the basis for the claim that they do pay taxes. They pay taxes on one-twenty-fourth!

Give God Credit for Niagara

The whole Ontario project is based upon a gift of God to man second to none that He in His reign has ever given—the Ontario development at Niagara. Let me tell you briefly what this is, though you may know it already. The Niagara River is less than thirty miles long. It is simply a connecting link between Lake Erie and Lake Ontario. The four Great Lakes of Superior, Michigan, Huron and Erie have a drainage basin of 263,000 sq. miles. All of the water, with the exception of 8,000 sec.-ft., which is taken out through the drainage canal at Chicago, passes through the notch at Lake Erie and falls 362 ft., in that thirty miles, to Lake Ontario. There you have a reservoir of 87,000 sq. miles, without the necessity of dams or storage arrangements, with a normal mean flow of 205,000 sec.-ft. Think of it! Think what that means! Then further, there have been times in the last forty years when the minimum flow has been down to 171,000 sec.-ft., and yet, notwithstanding that variation from a mean of 205,000 to a minimum of 171,000 there is no problem of water shortage for the development at Niagara because the treaty between the United States and Canada limits the water to be taken for power purposes to 56,000 sec.-ft. There will never be a question at any time in all the years that treaty exists when there can be a shortage of water for the maximum possible development at Niagara.

Think of that immense reservoir of Niagara power, the 362-ft. drop, 164 ft. of which is direct at the falls. There is nothing complicated, nothing to cause any one of our engineers, anybody on this coast, to hesitate a single instant about tackling the development of that property. The men who built Baker River, or Oak Grove, or those great works in California, would smile at the ease of that development as compared to the kind of problems we have met out here, and yet, with this God-given power, with this wonderful possible development in the heart of the greatest industrial center of the world, power is not produced, nor handed out to the consumers for any less, on an average cost, than it is by the progressive companies of the Pacific Coast.

Bear in mind that it will be charged that this wonderful thing in Ontario is a demonstration of the success of government ownership. Make them give due credit for what God has done there.

Relation of Generation to Total Cost

I was asked a peculiar question the other day, growing out of a statement I had made to the effect that if the cost of generating energy were nothing, there would be an infinitesimal reduction in the present cost of power to the average rural consumer. I had talked about Ontario and the cost of generating hydroelectric power and had shown there was every reason to believe the cost of generating power was much less at Ontario than at any development on the Pacific Coast. My friend asked afterwards, "Why did you devote so much time to showing the advantage of development at Ontario under which nature made it possible to generate power so cheaply as compared with developments out here, and at the same time stated that the cost of generation did not mean anything to our average rate?" Now that is a sample of the questions you will get. I am showing you now that if you raise any question in the minds of your auditors and leave it unanswered you will create a doubt as to the accuracy of all your statements.

Now the answer to this question is comparatively simple because you know that the cost of transmission and distribution is an important factor in the cost of power to a number of small customers, whereas it is comparatively unimportant in the case of a single customer using 5,000 to 10,000 hp. with a load factor of eighty or ninety per cent, being a load equivalent to 5,000 to 10,000 residential customers. Such a power customer will get a rate very close to the cost of generation because that and transmission are practically all the cost there is after transmission losses have been considered. This can be illustrated by showing the cost of the elaborate network of lines necessary to serve 10,000 homes as against the single line to the large power customer.

Political Aspects of Rates

Bear in mind also another point. It is the practice of most municipal plants, where they have the power to do it, to make rates attractive to the greatest number of people. By giving advantageous rates to the numerous small customers, popular favor is courted and secured, and the municipal scheme is entrenched. Private companies sometimes have met rates fixed by municipalities, not because they believed the rates were made scientifically, but because they thought it good business to do so. The municipal plant of Los Angeles charges a rate of 5.6 cents per kw-hr. for residence service applicable to the first 100 kw-hr. per month. Hence Los Angeles is called a 5.6-cent city, whereas Portland's top rate of 7 cents per kw-hr. for residence service classifies Portland as a 7-cent city.

The fact is, however, Portland's rate is cheaper.

In Portland, because we believe it is scientifically correct, we have established a step rate on the basis of the cost of service. The residence rate is the first thirteen kw-hr. for one dollar. The next seven are sold at seven cents, and the next fifty at three cents, and all in excess of that at two cents per kw-hr. Now take a use of 100 kw-hr. per month on the two rates and you will find that in Los Angeles it amounts to $5.60 per month, while in Portland it is $3.59.

This is one of the questions which will be propounded: Why is it Los Angeles has given so much lower rates than Portland if it is not because of municipal-plant operation?" The answer is that the rates are not lower, and furthermore that the Los Angeles Gas & Electric Corporation, now serving more than one-third of all the consumers in the city of Los Angeles, has exactly the same rate as the city plant. Municipal plants have not brought down rates in Los Angeles, nor in Seattle, nor anywhere else in Washington or California. They can't drive them down in Oregon. Sometimes you are forced, because of the unfair methods of the other fellow, to get away from the scientific method of rate-making, but the average price remains where it must be in order to meet the cost.

Believe in and Expound Your Cause

There are in every group of men certain of them who lead in the formation of opinions of the rest. That is human nature; there is nothing to do about that. There is a tendency, also well recognized, that the loyal employee, if he has confidence in his superior anywhere along the line, will have a far greater regard for the opinions of that superior than the opinions of an outsider. Now convince yourselves as to the facts involved in our cause, and, knowing that you are telling nothing but the truth, exercise the power given you by virtue of your position to create an opinion in your own immediate group in favor of the maintenance and continuance of public service as we understand it.

There are in every public service enterprise three cardinal elements: the public, which must be served fairly, equitably, honestly and efficiently; the men who make the wheels go 'round, the employees, that great staff composing the rank and file of the organization, who must be treated fairly and the revenues of the utility must be such as to pay fair compensation in proportion to the effort expended by the men who make it go;lastly, and by no means least, the third element is represented by the man whose money is in it. There must be far play and adequate reward for that man. Without money we cannot grow or make extensions. More money must be kept pouring into these enterprises continuously, and that process can't go on unless the money that is invested today, and about to be invested, is sure of fair treatment. Failure to observe the rights of any of these three elements means failure of the business.

We ought to believe in our own cause, and we ought to preach its gospel if we believe in it. We ought at every opportunity to seek to impress those with whom we come in contact that there is merit in the cause we represent, the cause of the existing order of things capable of continuing under the present policy of rewarding initiative rather than have to go to paternalism and socialism—to that even plane of all things on which the man of ambition and energy, who has a desire to grow in this world, stagnates and becomes ineffectual.

Public Relations Advisory Council Formed by Denver Utility

AN innovation in the way of inter-company organizations which bids fair to revolutionize all previously adopted methods of handling public relations has been inaugurated in the Denver office of the Public Service Company of Colorado with the formation of the Public Relations Advisory Council.

The purpose of the council is fundamentally to devise ways and means of better serving the public, to promote better public relations and to build good will.

This body, which is comprised of a group of sub-executives of the Denver office, is the result of the creative effort of Rufus G. Gentry, director of public relations for the Colorado company.

Sub-executives were chosen for the council in place of their superiors for the reason that it is these men who come most intimately in contact not only with the public, but also with the larger mass of employees through whom the most effective public relations must be attained.

The council, it is believed by executives and officials, is the first concrete expression evolved with a public utility personnel for the purpose of reducing to a tangible form the improvement of modes of service which would tend to promote better public relations.

Proof of their sincerity was evidenced by members of the council who made a few suggestions as to means which might be employed by their specific departments in advancing, in a manner that would be noticed by the public, the policies of courtesy, accuracy and efficiency which are constantly developing new possibilities for increased service to the public.

Members who make up this unique and highly important new body include Mr. Gentry, chairman; Frank R. Jamison, director of publicity; Robert Kelly, Investigation and Trouble departments; Charles H. Elliott, Contract department; Jack T. West, superintendent of the Sales Floor; Charles Sharland, Meter Reading department; O. L. Mackell, chief clerk; Gaylord B. Buck, superintendent electric sales division; Roy G. Munroe, superintendent gas sales division; A. A. Klinge, Fitting Shop and Gas Meter department; Earl Johnson, Credit department; E. Roy Johnson, appliance windows; E. P. Hodges, Electric Meter shop; John A. Miller, superintendent electric domestic sales; and William B. Walters, assistant manager of the Securities department.

Condensing Equipment

A Serial Report of the Prime Movers Committee, P. C. E. A.*

EFFORTS of this committee have been confined to trying to find causes and remedies for tube failures in condensers such as are used for condensing steam from prime movers in power plants. Tube failures are one of the principal sources of trouble in plants using sea water for condensing steam. The committee did not expect to find a sure cure for all the tube troubles but has tried to get information to prove whether or not different remedies as suggested by prominent engineers and scientists will give the relief which the authors claim.

The principal work of the committee was done by W. E. Thompson of the Southern California Edison Company.

It has been the general opinion for some time that air and sand in the cooling water are the principal causes of trouble at the Long Beach plants. Attempting to discover the possible truth of this, the following experiments and many others were made.

Effect of Sand in Water

Sand and fresh water were pumped through a new condenser tube for 150 hr. and the tube then was split for inspection. There was no evidence of pitting or grooving; the tube was polished like a mirror and evenly worn 1/64 in. No air was pumped through tube as system was closed. A velocity of the water through the tube of about 15 ft. per sec. was maintained in order to aggravate the trouble and accelerate the experiment. The temperature of the water was approximately 175 deg. F. The proportion of sand to water was all the sand that could be carried in suspension. The same experiment was tried with water at a velocity of 6 ft. per sec.; in this case tube was bright and clean but no wear could be detected.

Effect of Air in Water

Aerated fresh water was pumped through a new tube for about 150 hr. at a velocity of about 15 ft. per sec. The exact proportion of air to water was not known but admission was from ¼-in. needle valve ¼-turn open and under 100-lb. pressure. The temperature of the water was approximately 150 deg. F. The tube was coated over the entire inner surface with a hard, thin, black scale. Under this scale the tube was pitted from one end to the other, visible to the naked eye as very small specks.

The same experiment was tried with water at a velocity of 6 ft. per sec. The "specks" were found only in patches and were not seen so easily with the naked eye but were of the same appearance under the microscope as in the first experiment.

Clean sea water containing only that amount of air which is normally held in solution was pumped through a new tube at a velocity of 5 ft. per sec. for one week. Pitting was observed on the bottom near the outlet of the tube and the inlet end was covered with a red-brown slimy scale under which no pitting was detected. The scale was largely iron rust from the pump. The potential between tube and water was 0.10 millivolt; tube positive to water.

A 6-in. length of a new tube was split longitudinally and troughs made by closing the ends. One section was filled with sand which was kept moistened with sea water for 30 days and the other was filled with clean sea water. The trough which contained the moist sand was covered completely with small pits resembling those found in the air test; there was no evidence of corrosion in the trough containing clean sea water.

Clean sea water with normal content of air was pumped through a new condenser tube and a current of about ⅛ amp., d. c. was passed from the tube to the water. After one week this tube was pitted in about the same manner as the tube through which air and fresh water had been pumped.

These experiments indicate that air and sand or other solid particles in sea water are important factors in condenser-tube corrosion. Elimination of sand from condensing water is extremely difficult in existing plants and is a factor which should be given serious consideration in locating new plants and in designing intake structures.

Elimination of Air from Condensing Water

The removal of a portion of the entrained air in condensing water is not considered a serious problem. It is probably that portion which is readily removable which is the most active and does the most damage to the condenser tubes. In order to determine if air can be removed from circulating water in actual practice a circulating pump was equipped with two standpipes, one on the suction and one on the discharge side. These standpipes each were supplied with a valve at the top and at the bottom. The bottom valves were closed and the pipes filled with water, the top valves then were closed and the bottom valves opened. In the standpipe on the suction side, the water dropped until pressures were equalized and immediately a stream of air bubbles started up the standpipe and continued until all the water had been replaced with air. An exhaust pump working on this standpipe would have made the action continuous. In the standpipe on the discharge side a steady stream of very fine bubbles of air rose to the top and every few seconds quite a few large bubbles would rise. This pump obtained its water from the normal supply system and this water was of such quality as is used under normal operating conditions.

It is believed that apparatus can be developed for removing a large portion of the entrained air from condensing water at a cost which will be justified by the increased life of the condenser tubes.

Electrolytic Protection of Condenser Tubes

The 55,000-sq. ft. condensers of units No. 7 and No. 8 of the Long Beach plant have an electrolytic system of protection, using a low-voltage d.c. generator. The positive lead of the generator is connected to cast-iron lugs in the water boxes and the negative lead to the tube sheets. The value of this protection has not yet been demonstrated fully.

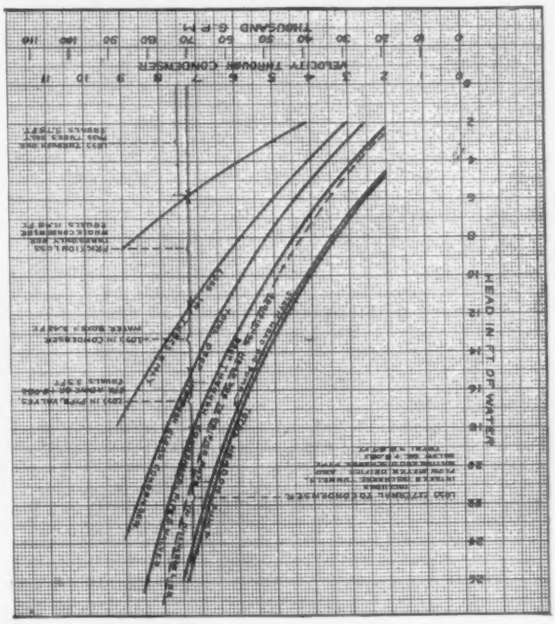


Fig. 1.—Distribution of pumping heads through circulating-water system on 55,000-sq.-ft. condenser.

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Copper anodes are being used to determine whether or not current is carried through the water in the tube to the tube by possible deposits of copper on the tubes. Preliminary examination indicates that copper is being deposited on the tubes.

At the Redondo plant a similar system appeared to give considerable protection, but this plant was troubled mainly with stray railway currents. At this plant the tube sheets were insulated from the condenser shell and from the water boxes by a heavy coat of armature varnish and all dowel pins between the tube sheet, shell and box were removed.

It is believed that corrosion caused by clean sea water which is free from air can be overcome by electrolytic protection. However, positive proof of this is lacking.

Artificially Scaled Tubes

Four condenser tubes were scaled artificially by circulating sea water at 125 deg. F. through them at a velocity of about ½ ft. per sec. and at the same time passing 1½ amp., d.c., per sq. ft. of tube from a zinc anode in the tank containing the water to the tubes. The tubes were coated for four days and then allowed to dry for 10 days before using. One tube coated in this manner was tested for 90 days in an experimental condenser and showed no evidence of corrosion. The other three tubes were installed in a condenser in actual service and preliminary examination showed no corrosion while other tubes in the same condenser showed considerable corrosion.

Effect of Oxide Coating on Condenser Tubes

Couples of cast iron and condenser tube material were made up and suspended in sea water at the inlet tunnels at Long Beach. The iron seems to afford to the tube some protection from corrosion as long as the iron is kept clean and free from rust. As soon as rust appears a slow action appears to take place on the tube, being apparently general over all the surface.

Cast iron and zinc "stars" were screwed into tube sheets and seemed to give a slight measure of protection. The zinc must be kept clean of corrosion scale or it will become cathodic to the tubes and tube sheets and thus increase corrosion. Cast iron does not seem to do this, although as it becomes covered with rust the potential between iron and brass becomes less.

The iron-oxide protection-coating theory is borne out by experience at the Santa Barbara plant, also of the Southern California Edison Company. At this plant tube failures are practically unknown. Some of the condensers had been in service 25 years when the plant was abandoned, and the tubes were practically as good as new or at least would have had another 25 years of life. Some tube trouble was experienced in this plant, but this was with tubes which had been previously used in other plants. Even these second-hand tubes gave longer life than new tubes in most other plants on the Pacific Coast.

The circulating water for this plant was taken at a point about 500 ft. from the shore and through a floating suction pipe so as to take water about 5 ft. below the surface and as far from the bottom as possible to avoid sand. Comparatively clean water was obtained. The water was pumped through about 1,200 ft. of cast-iron pipe. The quantity of water was small, due to large friction loss, and the temperature in the condensers was high as the vacuum on those types of units was usually about 25 in. to 27 in.

As a result of these conditions a scale was deposited in the tubes that was not of sufficient thickness to be objectionable, but formed a good protective coating about .003 in. thick. An analysis of this scale is given in the following table:

Material	Percentage
Silica	40
Calcium and Magnesium Compounds	10
Iron Oxide	36
Zinc	3
Iron	Trace
Tin	Trace

The tube from which this scale was taken had been tinned when first installed. The tin shown in the above analysis probably came from the surface of the tube.

A small condenser from the Santa Barbara plant, after doing 13 years of service, was moved to the laboratory at the Long Beach plant for experimental purposes. Tubes from this condenser were covered with a layer of scale about .003 in. thick. Water taken from the Long Beach plant intake was pumped through this condenser for 60 days, after which tubes from various sections of the condenser were removed for careful inspection. No new corrosion was in evidence but about 5 per cent of the tubes showed heavy corrosion for a distance of about ¼ in. from the ends. This probably can be explained by the fact that this condenser had been used in another plant before it was used at the Santa Barbara plant. Due to corrosion which was started at the first location of this condenser, it was necessary to retube this condenser in 1911 and it is probable that some of the best old tubes were re-installed at that time. This also explains the condition of the tube sheet which showed heavy corrosion which had been effectively checked long ago. All other tubes in this condenser showed absolutely no corrosion.

Steel Condenser Tubes

Sea water at a velocity of 5 ft. per sec. was pumped through a soft steel tube of 1 in. diameter and 22-gage thickness. Corrosion was rapid at first but as rust accumulated the rate of corrosion decreased. After 560 hr. the thickness of walls had decreased about 10 per cent. A similar tube was tested with sea water at 125 deg. F. and a velocity of 2 ft. per sec. and at the same time passing a direct current of 1½ amp. per sq. ft. between a cast-iron plate suspended in the water and the tubes, the iron plate being the positive terminal. A brown scale was formed on the tube and after a 3-days run the tube was removed and dried for 10 days, after which it was put on test again under conditions as mentioned for the first steel tube tested. Corrosion was very slow and after a test of 15 days was hardly noticeable.

Porcelain-Enameled Steel Tubes

Some 1-in. diameter, 22-gage steel tubes were porcelain-enameled and put through various tests. The heat transference of these tubes was about 80 per cent of that of a 16-gage brass tube. The enameled surface resisted sand erosion but developed minute cracks through which the salt water started corrosion of the steel tube. It is believed that there are great possibilities for such a tube provided an enamel can be developed which has a thin coat and which resists cracking, or an enamel can be produced which can be applied to metal of greater corrosion resistance than steel.

Other Coatings for Condenser Tubes

Several different kinds of paints, oils and greases were applied to tubes and their effect as a protective coating noted. All oils and greases failed, due to washing off. Some internal boiler paint gave good results and after a test of 90 days showed continued good protection. One paint made especially for this purpose seemed to increase corrosion and even to initiate it.

Muntz Metal Tubes

In the new Long Beach plant, by some accident, several Muntz Metal tubes were included in a shipment and were installed. In about six months they began to develop leaks. Tests showed them to be strongly anodic to the other or admiralty tubes.

Entrance nozzles were installed on two 55,000-sq.-ft. condensers in the Long Beach plant. These nozzles caused an eddy at the end of the nozzle which caused serious erosion and corrosion at this point and extending about 3 in. into the tube. The nozzles were removed but the action once having been started seemed to continue. In order to try to check this action all of the ends of the tubes for a distance of about 2 ft. have been painted with two coats of internal boiler paint. This paint is failing due to excessive erosion caused by rough tube surface. The manufacturers of the nozzles above mentioned are supplying some 5-in. nozzles which are long enough to bridge the affected portion of the tube. A few of these new nozzles will be tried out and results noted before deciding on a complete installation.

In the new 70,000-sq.-ft. condenser which is being installed with the 50,000-kw. turbine at Long Beach

the tubes will be allowed to extend into the water box 4 in. beyond the tube sheet, at the entrance end. The tubes will be expanded into the tube sheet at the entrance end, and the protruding end will be expanded into a bell shape to encourage a smooth and uniform flow of water in the tube at the entrance end. It is believed that this will decrease the friction loss in the tube and also eliminate erosion at the entrance end of the tube, a serious source of trouble in a large number of condensers.

Conclusions

Results of experiments and operating data collected lead to the following conclusions:

1. Good quality tubes should be procured.
2. Circulating water should be clean and free from solid particles and air.
3. Certain scales form effective protection to condenser tubes and greatly prolong their life. Such scales are sometimes formed in practice, but may be artificially produced.

TABLE I.—Table of condenser data from Long Beach plant.

CONDENSER UNITS

Item	1	2	3	4	5 & 6	7 & 8
Manufacturer	Wheeler	Wheeler	Alberger	Wheeler	Wheeler	Westing-house
Date installed	Sept. 1911	Feb. 1913	May 1914	July 1924	July 1924	Jan. 1925
Total number of tubes	4,831	6,069	7,535	5,012	2,696	10,504
Number in:						
W. auxiliary	1,150	1,184	2,247	..	..	..
E. auxiliary	0	0	2,247	..	..	..
W. main	1,840	2,442	1,798	..	..	..
E. main	1,741	2,443	1,798	..	..	..
Gage of tubes	16	16	16	18	18	16
Length of tubes F. to F. tube sh.	17' 2"	17' 2"	17' 2"	17' 9"	17' 3"	20' 3"
Outside area of 1 tube, sq. ft.	4.25	4.25	4.25	4.5815	4.25	5.236
Thickness of tube sheet	1 in.	1 in.	1 in.	1¼ in.	1¼ in.	1½ in.
Total area sq. ft.:						
Rated	21,497	27,000	32,000	23,000	12,000	55,000
Actual	20,532	25,793	32,023	22,963	11,458	54,999
Sq. ft. per kw. actual	1.711	1.719	1.6011	2.296	1.909	1.571
Number of passes	2	2	2	3	2	2
Inside area of tubes per pass, sq. ft.:						
1st pass	9.1432	10.6273	19.8500	7.2940	5.9541	21.48257
2nd pass	12.1953	16.1795	15.8835	7.7783	5.9541	21.48267
3rd pass	..	..	..	7.0672	..	..
No. of tubes per pass.:						
1st pass	2,070	2,406	4,494	1,651	1,348	5,252
2nd pass	2,761	3,663	3,596	1,761	1,348	5,252
3rd pass	..	..	..	1,600	..	..
Circulating water, G. P. M.	24,000	30,000	40,000	18,000	10,500	70,000
At R. P. M.	240	350	265	..	445	290
Sec. ft.	53,472	66,840	89.12	40.104	36.762	115.95
Velocity through tubes, ft. per sec.:						
1st pass	5.848	6.2849	4.4896	5.489	6.1742	7.259
2nd pass	4.3846	4.1311	5.6108	5.155	6.1742	7.259
3rd pass	..	..	..	5.674	..	..

Sea water is used at this plant for injection water, the extreme temperature variations being from 55 deg. F. to 75 deg. F. The average tube life on units Nos. 1, 2 and 3, which are the only ones in service long enough to obtain reliable data, is 4½ years. The condensers of these units were retubed during 1925 so this gives a good period over which to obtain tube life.

Operating Data 55,000-sq.-ft. Condenser

Fig. 1 shows graphically the results of tests of friction loss and other losses in various parts of the path of the circulating water through a 55,000-sq.-ft. condenser at Long Beach. Under normal operation these condenser tubes become coated with a thin layer of slimy marine growth which increases the friction loss in the tubes about 0.7 ft. and reduces the heat transference in the ratio of 350 to 300. This coating of slime will not wash off but can be blown out with air at about 100-lb. pressure. It is necessary to blow the tubes about every 3 or 4 months.

The tubes of this condenser are packed at each end as follows: Beginning at the water-box end of the packing, a 1/16-in. fiber ring, 3/16-in. fabric packing impregnated with beeswax and tallow, ¼-in. metallic packing, ⅛-in. fiber ring. This packing is proving fairly satisfactory except that the fabric packing is distintegrating and will be omitted in the new condenser soon to be installed. The new packing job will consist of a ¼-in. fiber ring and a ⅜-in. metallic ring.

An interesting case of trouble was encountered in the air ejector of this condenser which is of the "radojet" type. A gasket between the salt-water compartment and the condensate compartment of the intercooler sprung a leak allowing condensate to leak into the cooling water. This leak gradually increased over a period of 3 months when it had reached a maximum of 400,000 lb. per day, causing the make-up water to be four times as high as it should be. The unit was shut down, the trouble located and remedied.

The Pacific Gas and Electric Company reports conditions and experiences with 4 condensers in plants in San Francisco. Engineers of that company are convinced that the life of tubes is considerably longer with low-velocity cooling water and elimination of air in the water. With high-velocity water most of the tube failures are near the entrance end while with low velocity the whole tube gradually becomes brittle and weak. The life of tubes in one condenser was prolonged about a year by the use of entrance nozzles.

The San Diego Consolidated Gas & Electric Company reports an interesting experience with the condenser of a 15,000-kw. turbine. This turbine was placed in operation Feb. 14, 1923, and 38 days later 3 tubes with holes pitted in them were removed. By the end of the year, 110 tubes had become pitted and after 54 weeks of service 488 tubes had become pitted. Due to the rapid increase of failures the unit was taken out of service and a new set of tubes installed.

The unit was placed in service again April 14, 1924, with a new set of admiralty tubes and 55 days later another pitted tube was removed. During the next 5 months the tube failures averaged one tube per day and during the subsequent 4 months the failures averaged 2.2 per day. From March, 1925, to the present time the tube failures have averaged .57 of one tube per day.

Records of location and date of tube failures have been kept and it is an interesting fact that during the period from Aug. 15, 1924, to the end of the year there were 15 failures in the first pass and 132 in the second pass, but from Aug. 1, 1925, to the present time conditions have been reversed and there have been 82 failures in the first pass and 10 in the second pass.

Brass caps are screwed over the ends of the leaky tubes in place of the ferrules and then large numbers of the accumulated failures are renewed at a convenient time. During September, 1925, 190 tubes in the first pass and 281 in the second pass were renewed. The tubes removed were examined to find the location of the failures, most of which were near the entrance end of the tube. Curves have been plotted showing the number of tubes which were pitted at different distances from the water entrance ends for each pass. These curves are shown in Fig. 2. It is not known why so many of the tubes are pitted near the entrance end. The water does not contain very much sand and the circulating-pump suction is tight and free from air leakage.

The condenser is provided with equipment for cleaning the tubes with a jet of water at 200-lb. pressure while in operation. This cleaner was used every day for about a year. Then it was thought that possibly the jet might have the effect of eroding the tubes too much or of washing off a coating of protective scale and the number of cleanings was reduced to 2 per week. The velocity of the circulating water through the tubes is about 5.5 ft. per second.

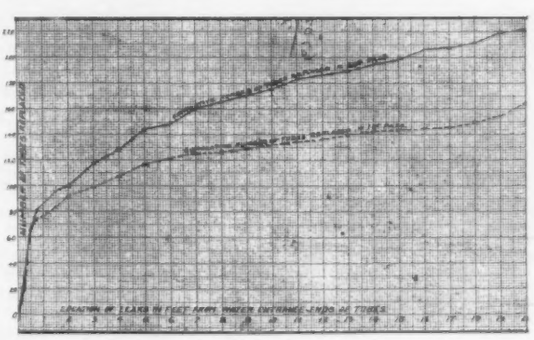


Fig. 2.—Curves showing location of leaks in tubes removed from condenser of 15,000-kw. turbine at San Diego.

CENTRAL STATION CONSTRUCTION OPERATION AND MAINTENANCE

Ground Detectors Warn of Dangerous Conditions

Design Features and Operating Characteristics of Various Types of Instruments Outlined and Compared

By L. F. Hunt, Development Engineer, Southern California Edison Company, Los Angeles.

In most of the distribution substations of the Southern California Edison Company the low-tension sides of the transformer banks are delta-connected and therefore have no ground connections. With this arrangement a ground occurring on a circuit does not develop sufficient short-circuit current to kick out the circuit breaker on that particular circuit. However, a grounded feeder presents an extremely hazardous condition, and it becomes necessary to use a ground detector to give the operator an indication of the condition of his circuits. The state law also makes it necessary to have some device to give an indication when a line becomes grounded.

Satisfactory operation of a ground detector presupposes its ability to indicate even the slightest ground and also to withstand a full ground. The most serious case of a ground is where a line has dropped on dry earth or pavement. Such grounds are of very high resistance and thus cause but little voltage change on the line affected, as far as substation indications are concerned. Early ground detectors to be found on the market would not satisfy the requirements. Therefore power-company investigations were directed toward the development of a detector that would meet the desired conditions.

Armstrong Type

Electrical connections of this type of detector are shown in Fig. 2. It may be noted that three potential transformers are used, star on the high side and delta on the low side with the lamps worked in as shown. When a bell is used it may be controlled by a telegraph-relay connected across the open delta as indicated in Fig. 2, or it may be of the resonant type that will ring with very little energy at 50 cycles.

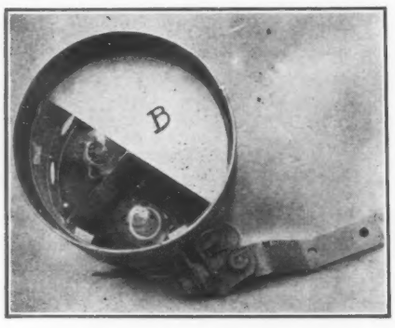


Fig. 1.—Partially cut-away view of Armstrong type of ground detector.

When a ground occurs on any leg of any of the lines fed from the bus to which is connected the ground detector the voltage across the primary of the potential transformer is reduced in proportion to the conductance of the ground; that is, if a full ground occurs the voltage across the primary will be zero. In this case the secondary voltage of that transformer also would be zero and the lamp across that secondary would be completely dark. Thus in the case of any ground the lamps so indicate by an unbalance in brightness. Phase letters are marked on the frosted glass front and a chart showing typical lamp brilliancies for certain ground conditions is provided for the guidance of the operator wherever this instrument is used. In cases of heavy grounds the voltage difference across the bell is sufficient to cause it to ring.

The advantages of this type of detector over the earlier types are that it gives more definite results from grounds and that it distinguishes the particular phase in trouble. The disadvantages are: since the development of this type carbon lamps have been discontinued and are hard to get; on slight grounds it is difficult to distinguish the differences of lamp brilliancy; in daylight where the light is very strong it often is difficult to distinguish the differences.

Under normal conditions the vectors of primary voltage are as shown in Fig. 2 (left) as A, B, and C; secondary vectors are shown as W, X, Y, and Z. This shows that the voltages across each of the lamps are equal; there is no voltage across the bell. With a full ground the vectors are as shown in Fig. 2 (center); vectors YX and XW have increased, ZY reduced to zero and WZ markedly increased, giving a voltage across the bell. A ground of about 50 per cent intensity produces a condition indicated by the vectors in Fig. 2 (right). Others follow the same general law.

Voltmeter Type

The so-called voltmeter type of ground detector consists of an ordinary-appearing horizontal edgewise voltmeter and a bell mounted on a panel. The voltmeter is fitted with mercury contacts that close when the voltage drops to 30 or increases to 90. When these contacts are closed, a circuit is completed through a source of potential and a small relay, causing the bell to ring. The appearance of the instrument is as shown in Fig. 3.

Electrical connections are as shown in Fig. 4, the voltmeter connected across the secondary of a single potential transformer. Through the disconnecting switch the primary of the potential transformer may be connected between ground and either of two phases of the bus.

Normal voltage to ground is 57.7 per cent of line voltage, so under normal conditions the voltmeter reads approximately 63.5 volts when the potential transformer has a normal secondary voltage of 110. In case the leg of the bus to which the detector happens to be connected becomes fully grounded the voltage across the instrument drops to zero. However, if the ground occurs on one of the other two legs the voltmeter will register approximately 110 volts. To determine which of the two legs the ground last mentioned may be on, the disconnecting switch is swung over to the opposite leg; if the voltage remains the same the ground is on the leg of the bus to which there is no connection and if the voltage drops, the ground is on the leg to which connection was just made. The greater the intensity of the ground, the greater is the divergence in the meter reading from the normal of 63.5 volts.

The advantage of this type of ground detector is that it requires but one potential transformer. Its disadvantages are that the mercury contacts require constant attention; there is no reading for very slight grounds; a ground of nearly 50 per cent intensity is required to ring the alarm bell.

Vectorial voltage relations are shown in Fig. 4 where normal con-

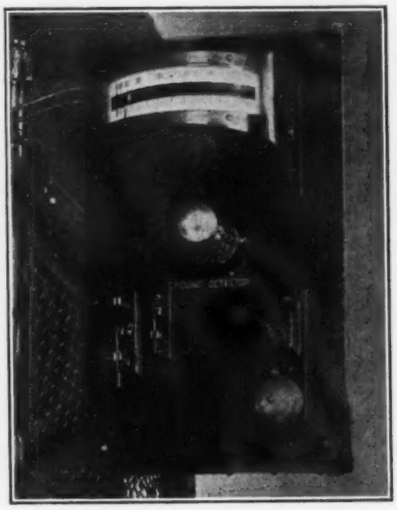


Fig. 3.—Voltmeter-type ground detector.

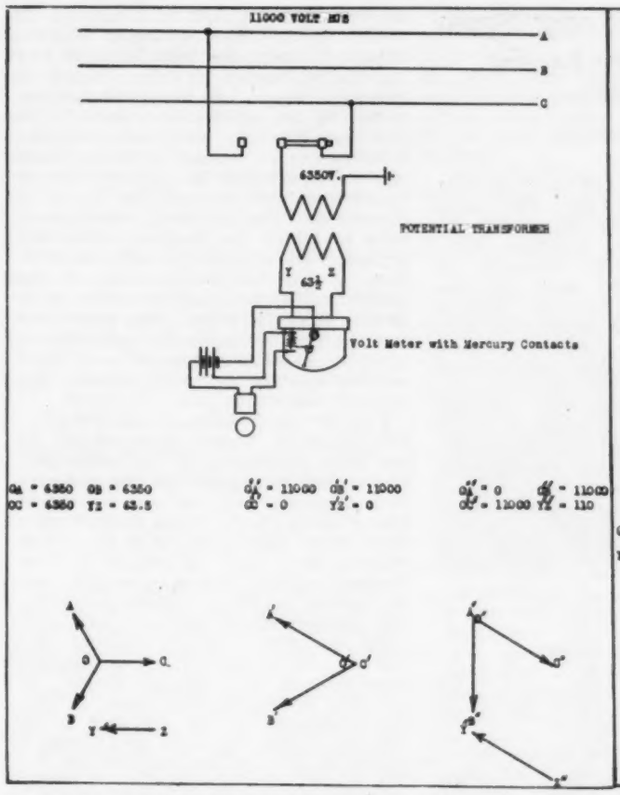


Fig. 4.—Wiring and vectorial diagrams for voltmeter-type ground detector.

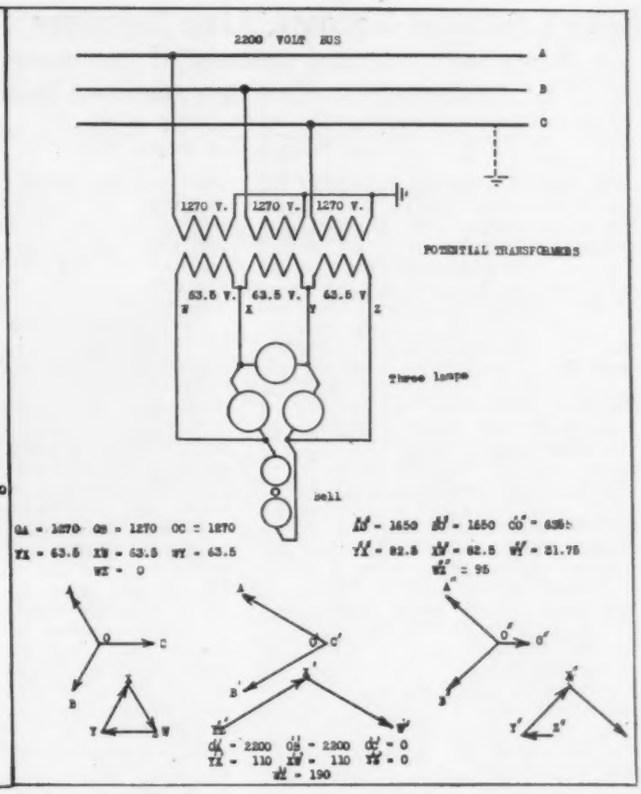


Fig. 2.—Wiring and vectorial diagrams for Armstrong ground detector.

ditions are indicated at the left, a full ground on phase C (center) and a full ground on phase A (right).

Hot-Wire Type

A hot-wire-type ground detector has the appearance of a large glass-front meter with a circular target in the center. This circular target is the indicating arm of the instrument. The target is balanced on a pivot by means of three members, each of which is attached to a current-carrying wire. These wires are stretched between terminal blocks and each is so arranged that the target maintains a central position under balanced line conditions. A change in the tension of any of the wires causes a corresponding change in the position of the target with respect to the index painted on the glass front of the instrument. Fig. 5 shows the hot-wire type ground detector as installed.

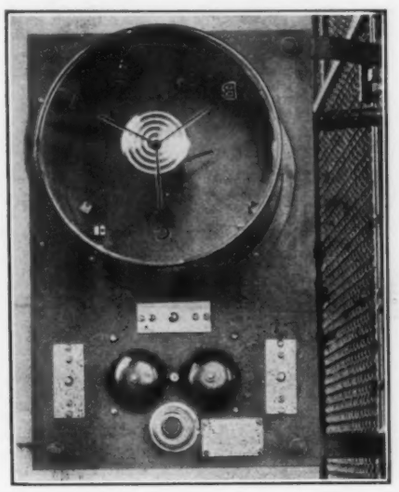


Fig. 5.—Hot-wire-type ground detector.

Electrical connections are shown in Fig. 6. It may be noted that each of the "hot wires" is energized from the secondary of a bell-ringing transformer which it short circuits. The three potential transformers are connected star on the high side and delta on the low side. The bell-ringing transformer primaries are connected one each to each of the secondaries of the potential transformers as indicated. The signal bell as usual occupies a position across the open delta of the potential transformers.

Normally each wire carries the short-circuit current of one of the bell-ringing transformers. Thus each wire has a certain heat dissipation to take care of and accordingly expands a certain amount (lengthwise). Normal voltage across the primary of each bell transformer is 63.5. When a ground occurs the voltage to ground of the leg involved is reduced and corresponding voltages of the other legs (to ground) is increased. This increased voltage and consequently increased current in two of the "hot wires" causse them to expand an abnormal amount. At the same time the reduced voltage and consequently reduced current in the third "hot wire" causes it to contract. The net result of this action is to throw the target indicator off-center in the direction of the grounded leg and a distance proportionate to the intensity of the ground. For purposes of testing the three "hot wires" push-buttons are installed in the primary circuits of the bell-ringing transformers. Depression of a push-button causes the stoppage of the current flow in the corresponding "hot wire," causing it to contract and throw the target to that side, if the instrument is in working order.

Advantages of this type of instrument are that it gives the phase of leg in trouble and gives a definite deflection. The disadvantages are that the bell-ringing transformers are not consistent, causing vibration in some cases; and that trouble has developed in keeping the targets on center.

Vectorial relations for the hot-wire detector are as shown in Fig. 2. Normal relations are as shown at the left. A full ground on leg C produces relations shown at the center. Other conditions are similar.

Editor's Note: The concluding half of Mr. Hunt's article on Ground Detectors will appear in an early issue of the Journal of Electricity.

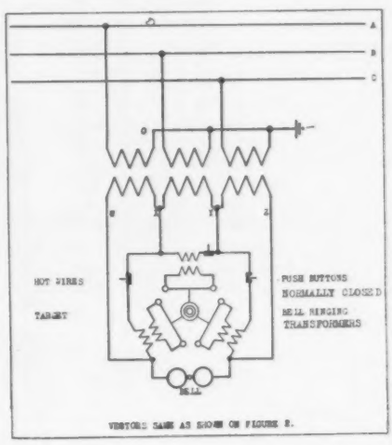


Fig. 6.—Wiring diagram for hot-wire-type ground detector.

Lake Cushman-Tacoma Line Involves Long Span

Design and Structural Features of the World's Longest Transmission Span Are Discussed Briefly

By A. F. DARLAND, Superintendent of Electrical Construction, Cushman Power Project, Tacoma, Wash.

The most interesting feature of the new double-circuit 110-kv. Lake Cushman transmission line is the span across The Narrows of Puget Sound. This is believed to be the longest aerial span in the world for the transmission of electrical energy. The Narrows is a navigable channel 4,800 ft. wide from shore to shore and flanked by bluffs about 275 ft. high on the west and 330 ft. high on the east side. The best tower sites on the tops of these bluffs are some distance back from the water's edge, necessitating a total span of 6,241 ft. 6 in.

To secure a minimum clearance of 200 ft. over the water as required by the war department, and this under extreme weather conditions when the ice-laden cables might have a maximum total sag of 397 ft., the main supporting towers were designed to have a total height of 316 ft. 6 in. from the concrete bases to the top of the superstructure. The towers are of the simple prop type and are rectangular in form, being 54 ft. square at the base and tapering to the top. At a height of 313 ft. a 69 x 12-ft. deck is provided as a working area and for inspection purposes. The balance of the total height is taken up by 6-ft. sheaves, whose bearings are mounted level with the deck. The deck is reached by a light stairway with double railings and with landings at convenient intervals. In design the use of the least possible number of members and the greatest possible ease of erection were considered, together with economy of material. The familiar built-up type of column, consisting of an I-beam and two channels was selected. The minimum thickness of metal used is 5/16 in. with possibly a few minor exceptions. The maximum computed reaction at the base of the columns is 310,000 lb. and the greatest uplift 89,000 lb. while the greatest stress in any of the diagonals is 33,500 lb. The total weight of each tower is 260,000 lb. All four towers are identical, irrespective of the 53-ft. difference in elevation between the east and the west pairs.

Each circuit crosses on its own pair of towers, which are spaced to produce a minimum horizontal clearance between circuits of 120 ft. The conductors in each circuit are arranged in a horizontal plane with 30-ft. clearance between phases. The conductors are 1¼-in., 35-strand, self-supporting concentric-reverse-lay, plough-steel-wire cables, having an ultimate strength of 180,000 lb. after galvanizing and stranding. The net area is 0.93 sq. in. and the weight about 3¼ lb. per linear ft. This cable affords a safety factor of three under maximum loading of ice and wind which was taken at 60,000 lb. produced by a wind load of 8 lb. per sq. ft. on the projected diameter of the cable when encased in ½ in. of ice at a temperature of 0 deg. F.

Each conductor proper terminates in an open socket and clevis attached to a nest of twelve parallel strings of Locke high-strength suspension insulators of eleven units each. One 90-ft. and one 70-ft. relieving cable extends out from the insulator yoke and along the main cable. These relieving cables are attached to the main cable by a series of steel U-bolts evenly spaced; the U-bolts were applied successively beginning at the outer ends of the relieving cables. While these clamps were being applied, the relieving cables were stressed in successive increments in order to put equal stress on all clamps. The purpose of these relieving cables is to reduce terminal stress in the main cable and to clamp out cable vibrations. Mechanical loading of individual strings is equalized by means of calibrated springs. The insulator strings are held between two rigid steel frames or yokes conical in general shape. Two supporting cables attach to the shore-side yoke of this insulator assembly and pass over the 6-ft. sheave and thence down and back approximately 900 ft. from the tower to concrete anchors imbedded 24 ft. in the earth. The structural steel members to which the anchor cables are attached are carried through the concrete to the extreme back end of the anchor. The two anchor cables give double strength where they pass over the sheave and facilitate replacements or take up. Either anchor cable may be slackened or removed without disturbing the other.

Jumper conductors of 300,000-circ.-mil. stranded copper cable attach to the steel conductors on the water side of the insulator assembly and are carried through and around the main towers back to switching towers situated near the cable anchors. The transmission lines approaching The Narrows from either direction are dead-ended on these switching towers. The disconnecting switches are provided to isolate either crossing circuit and to parallel the transmission lines through one crossing circuit. If or when necessary, any three of the six conductors of the crossing spans may be selected to serve as the three phases of a single crossing circuit.

Tower foundations and cable anchors were constructed at a cost of $33,000. The contract for the fabrication and erection of the main towers, together

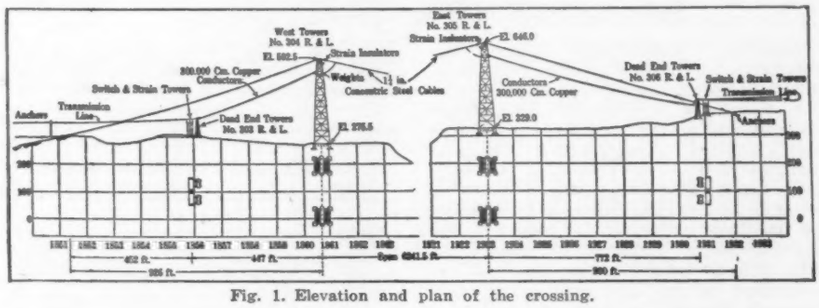


Fig. 1. Elevation and plan of the crossing.

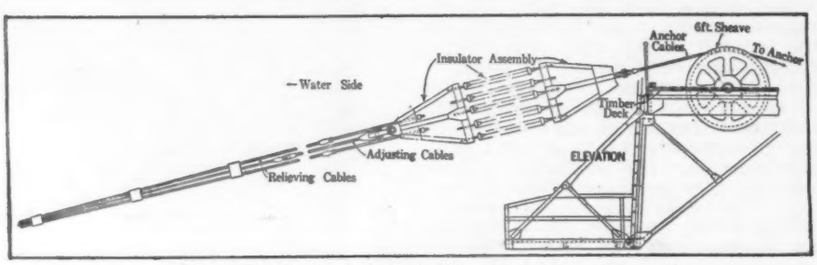


Fig. 2. Showing typical construction at the tower tops.

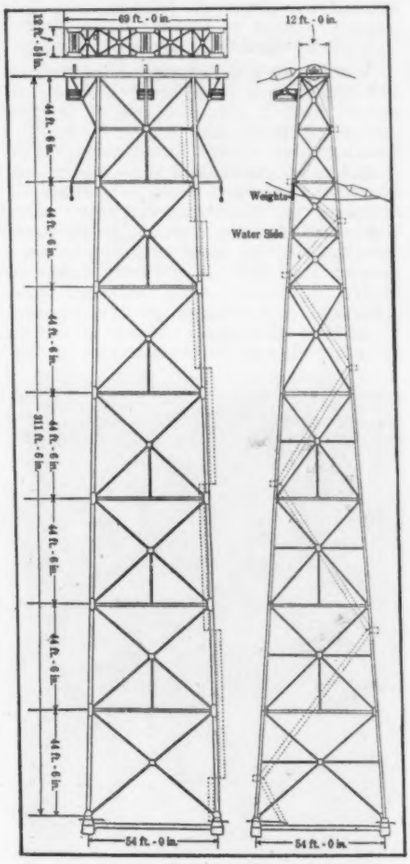


Fig. 3. Showing general design features of the crossing towers.

with the switching tower and for stringing the cable, was awarded to the Star Iron & Steel Company, Tacoma, for $149,000. John A. Roebling's Sons Company furnished the cables, fittings and insulator assemblies for $37,600, making the complete cost of the crossing $219,600. Stringing of the cables was commenced early in November, 1925, by J. B. Murphy, a sub-contractor under the Star Iron & Steel Company's contract.

The structural design of this crossing span is attributable to J. V. Gongwer, superintendent of mechanical construction on the Cushman project, who acted as resident engineer during construction. The project is being carried on under the general supervision of J. L. Stannard, chief engineer.

Electric Welder Permits Field Repair of Large Valve

By H. Shields, General Superintendent, Nevada Valleys Power Company, Lovelocks, Nevada.

Electrical welding was used to advantage to repair a damaged 4-ft. cast-iron gate valve at the Lahontan plant of the Nevada Valleys Power Company, near Hazen, Nev.

After a protracted cold spell during which the temperature was nearly always below zero, at one time down to 17 deg. below zero, this valve cracked around the top of the bonnet for a distance of nearly 5 ft. The valve had been partly uncovered during some construction work. The whole valve and the adjacent excavation soon was a solid mass of ice.

An examination of the damage and advice of different welders caused the selection of electrical welding equipment. The necessary pre-heating and annealing attendant upon the use of other methods of welding meant the removal of the valve and its shipment to some shop having equipment large enough to handle the job. Further, this latter method would have meant lost time and greater expense in general.

Accordingly the electrical welding machine was shipped from San Francisco by the Welding Service & Supply Company. The actual welding was done by A. L. Requa of that firm. Actual time consumed on the job was only about 48 hr. The method used is shown plainly in the accompanying illustrations. After cleaning and chipping the crack, another groove about ½ in. wide and ¼ in. deep was made all around the crack and about 2 in. from it. Several steel straps, ⅜ x 2½-in., then were fitted across the break and around the corner of the bonnet. These steel straps were placed about 10 in. apart and stuck in place by the welder.

The next step was to drill ⅜-in. holes, 2 in. apart, in outline around the straps and along the shallow groove. These holes then were tapped out and steel studs screwed in and

Fig. 2.—Close-up of section of repair job showing straps, studs and outline.

broken off flush. Metal then was deposited along the line of studs, around the ends of the straps, making an outline of the whole patch. This outline then was filled in toward the center in a manner similar to that of a deckhand in coiling a piece of rope from the periphery toward the center of the coil. When the job was completed the whole crack and a space of from 3 to 5 in. on either side was covered completely with deposited metal. The depth of this deposition was from ¼ to ½ in.

Fig. 3.—Finished repair job showing leaks which soon stopped themselves.

Fig. 1.—Difficult conditions under which valve repairs were made. Shows straps, rows of studs and start of patch outline.

Under 48-lb. pressure the repaired valve developed several minor leaks when first restored to service. However, all of these stopped themselves within a few days and the valve has remained in full service for more than two years since the repair.

Suburban Capacity Increased by Cut-Over to 4 kv.

By R. H. Taber, San Diego Consolidated Gas & Electric Company, San Diego.

The problem of supplying adequate primary feeder capacity for increasing power and lighting loads in rapidly developing urban or suburban districts may be met in several ways: by additional feeders from generating or substations, by increased copper in existing feeders, or by increased voltage on existing feeders.

Where 3-phase, 2.3-kv. primary distribution feeders are in use and generating or substation conditions permit, current practice shows a marked trend toward the last of these expedients. Modification to 4-wire, 4-kv. distribution offers at once a relatively large increase in load capacity with only minor changes in transformer equipment and with simple line alteration at minimum cost.

During the last 2½ years the San Diego Consolidated Gas & Electric Company has found the 4-kv. distribution system most satisfactory for many of the most important urban feeders in residential districts. As a result this lately has been extended to a number of the suburban feeders.

Conversion from 2.3 to 4-kv. though not a difficult process, requires particularly careful attention to detail on the part of the line foreman. Detail may be reduced to a minimum by the use of a plat of the district showing the complete feeder with all 2 and 3-wire extensions, on which are spotted the distribution transformer stations, their capacity and the phase to which they will be cut for balanced load at 4 kv. One of the first steps in making the change is the installation of a temporary substation to maintain service at 2.3 kv. while making any necessary alterations in the main substation for 4 kv. After the extra copper for the fourth wire and such extra phase-wire extensions as may be necessary has been strung, insulators changed and other details completed, the fourth wire is tied to one phase of the existing 2.3-kv. supply and all single-phase load cut over according to the district plat.

Three-phase distribution stations require special attention. It equipped with 3-phase, 2.3-kv. transformers with no 4-kv. taps, the transformers must be changed. The cut-outs on all 3-phase stations should be pulled just prior to actual line-voltage cut-over and taps changed on 3-phase transformers, or one phase reversed if open delta. A rotation check also is advisable.

Sunlight intensity in an open field is 8,000 ft.-candles; in a street between buildings—3,000 ft-candles; in the shadow of a building—300 ft.-candles; in an ordinary office—from 100 ft.-candles on the north side to 20 ft.-candles in the center of the room.

IDEAS FOR THE CONTRACTOR

Electrical Equipment in a Citrus Packing Plant

Exeter Citrus Association Uses Electric Heat in Coloring Process and Also Has a Large Motor Installation

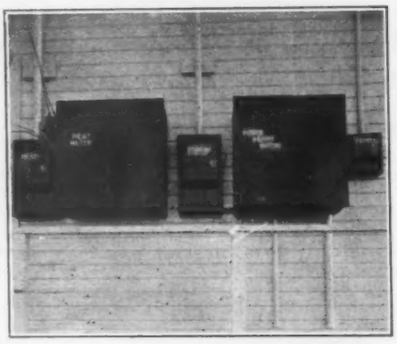
The use of electricity in the citrus packing industry has grown rapidly in the last few years until nearly all of the operations now are performed by electricity. The Exeter Citrus Association plant in Exeter, Calif., is an outstanding example of a modern plant. In it there are many conveyors for automatic handling of boxes and fruit, and electric air heaters are used in the sweating process to bring out the color of the fruit.

Electricity for power and heating is supplied from 110-220-volt, 3-phase current. The installation includes 16 circuits for electric air heaters and provision is made for 15 motors. In addition there are 14 lighting circuits.

The full boxes of fruit are placed on a conveyor directly from the trucks which bring them to the plant; this conveyor leads to an elevator which automatically dumps the fruit when the box reaches the top, the fruit going one way and the box the other. The boxes continue on a conveyor back outside to the loading platform where they may be placed on the trucks.

The fruit then is cleaned by passage through a series of dry brushes, whence it goes to the grader. If the fruit is too dirty to be cleaned in this manner, it is diverted before reaching the dry brushes and is passed through a pan of water and over a group of spiral brushes, then it travels up an elevator consisting of a series of rollers and then is passed under a series of fans to dry it. The travel under the drying fans extends over a total distance of 60 ft., consisting of a run of 30 ft. and back. There are 12 drying fans, all on one shaft and operated with one motor. The dry fruit then is conveyed to the grader.

Nine girls divide the fruit into four grades: extra fancy, fancy, choice, and standards. The fruit then passes to the sizers where each size falls into the proper bin. It is packed from the bins into boxes which are placed on conveyors which take them to the press where the boxes are nailed up. From there they are conveyed to the railroad car for shipment. The only manual operations in the whole process of packing are the grading and wrapping of the fruit.



Main switches and meter cabinets for the Exeter Citrus Association. The air heaters are metered separately.

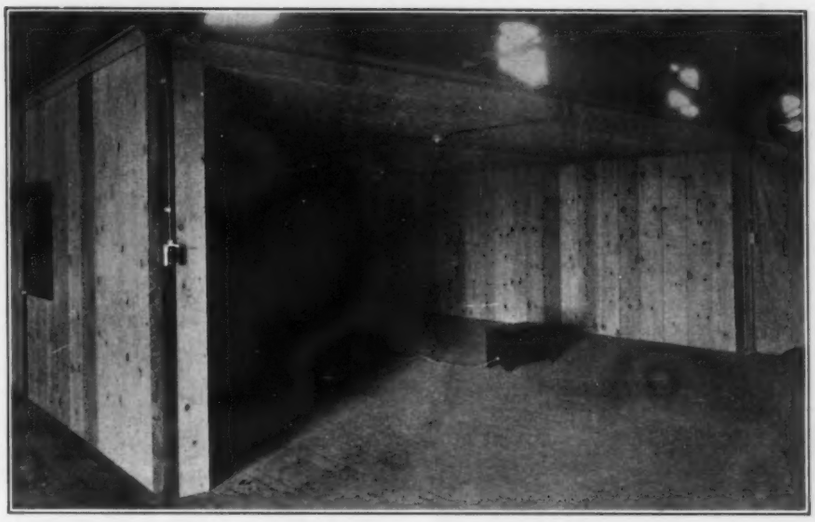
The installation and control of all motors is interesting. They are all Fairbanks-Morse motors, controlled with General Electric CR 7006-D4 magnetic switches. All motors on the main floor are controlled from a central control station by the head grader. This station is elevated so as to give the operator a clear view of the entire plant, with its multiplicity of conveyors and belts. Each motor has its start and stop button at this station, and there is one master control which stops all motors in case of emergency. In addition to this station, the two motors driving the fruit-box elevator have emergency stop-switches in the basement. There are also lock-stop switches for the fruit elevator.

When necessary the color in the fruit is brought out by the sweating process using ethyl gas. The fruit is placed in sweat rooms in boxes, and then the temperature is raised to 76-80 deg. F., at which it is maintained from three to four days, depending on the color of the fruit. Ethyl gas is injected into the room three times a day. The heating in the sweat rooms is done with electric air heaters made by the Exeter Electric Company. They consist of commercial strip-heaters mounted in heater frames. The heating load in the sweat rooms totals 75 kw. An auxiliary operating panel is located on the main floor for breaking the circuits in the sweat rooms; the fuses on these circuits are located in the basement. There are nine sweat rooms, three of them being on the main floor and each having a capacity of 1,200 boxes of fruit at a time; six larger sweat rooms in the basement of the plant have a capacity of 1,750 boxes each.

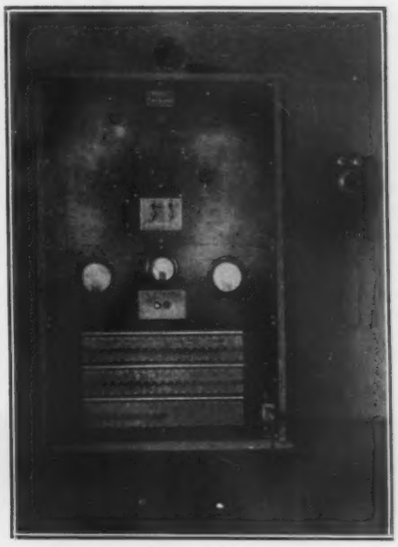
During the 1926 season this plant

Lighting panel, disconnecting and magnetic switches for the motors in the Exeter Citrus Association plant. The head grader controls all motors on the main floor from the raised platform back of this board. The gutter for the control switches may be seen above the lighting cabinet.

Dirty fruit is washed and then dried by passing under a series of fans; these drying fans as well as the motor which operates them may be seen in the background. The conveyor on the left carries the fruit under the fans. The motor in the foreground operates dry and washing brushes.



One of the sweat rooms on the main floor, showing one of the electric air heaters. The auxiliary operating panel for the air heaters may be seen on the extreme left.



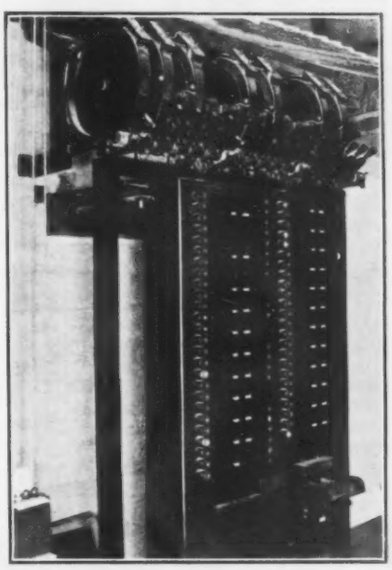
The audio frequency amplifier station installed in the principal's office.

expects to pack 150 cars of fruit, averaging 462 boxes to the car, or a total of 69,300 boxes. The plant packs oranges and grapefruit. Navel oranges usually are packed during November and December and the Valencias in May and June.

Benjamin RLM reflectors with 100-watt lamps on 12-ft. centers are installed for lighting. The offices of the plant are heated electrically, and duplex convenience outlets are installed for use of electric office equipment.

Chase nipples are installed between the disconnecting switches and the magnetic switches controlling the motors. In this way it was possible to improve the appearance of this board which is located in a conspicuous place on the main floor. Trumbull switches are used throughout the job. The ground wires are all in conduit and none of them are smaller than No. 6. All of the wiring is in galvanized conduit and rubber-covered wire is used exclusively; all receptacles are porcelain. The electrical installation was made by the Exeter Electric Company.

battery is installed for the telephone system. The electrical installation was made by the Nielsen-Smith Electric Company of Santa Barbara.



The stage board in the main auditorium. Cutler-Hammer dimmers are installed above the board proper; Demco protected-type switches are installed at the bottom.

Extensive Loud-Speaker System Is Used by School

Modern Loud-Speaker Equipment and Telephone Call System Installed in Santa Barbara High School

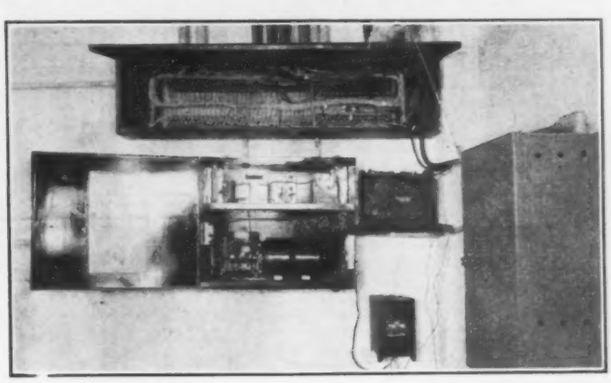
An excellent example of modern loud speaker equipment and telephone call system is that installed in the high school at Santa Barbara, Calif.

A Magnavox audio frequency amplifier is installed in the principal's office. From this station it is possible to speak to every room in the building at once or to any one individually, loud speakers being installed in each room. The system may be connected to a radio set, and any particular program may be heard by all of the students without any of them leaving their rooms. This eliminates the confusion and time lost in gathering of students together in a central auditorium. It is planned to receive programs such as the president's inaugural address and others of an educational value.

The telephone call system provides that the principal may call any room, and, after talking with the teacher in that room, the loud speaker in the room may be connected directly with the principal's office by merely throwing a switch.

The small motor-generator set in the boiler room provides power for the tubes in the amplifier, while a storage

The Santa Barbara High School contains a complete loud speaker and telephone call system.



Motor-generator set, storage battery, and telephone connections in the boiler room in the Santa Barbara High School.

Electrical Estimating for the Contractor — IX

Continuing the Discussion of Belt and Line-Shaft Problems Met by a Contractor in the Power Installation Field

By J. R. WILSON,* Engineering Department, Los Angeles Electric Works.

Information pertaining to belts is very desirable to have for reference. The data presented here are additional to those contained in the previous article of this series. Leather belts always should be run with the grain or hair side to the pulley. A belt made of firm leather cut from the back or center of the hide run grain side to the pulley will draw 35 per cent more than the flesh side to the pulley, 50 per cent more than rubber and 120 per cent more than canvas.

It is sometimes desired to change the speed of a machine, and this usually is done by changing the size of the driving pulley on the line shaft. If the pulley is larger than the old one it will be necessary to piece the belt, thereby making it longer. One and one-half times the difference in the diameter of the new and the old pulley will give the length of piece.

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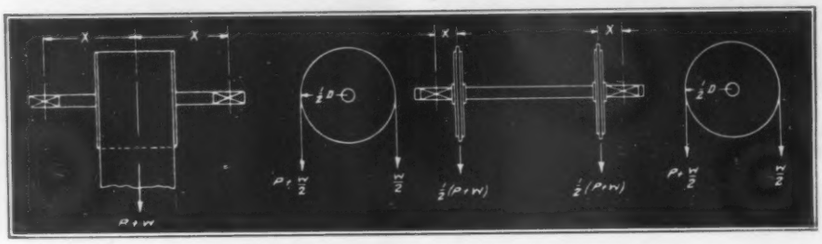


FIG. 1

The following formulae apply to both of the above diagrams:

Bending moment = ½ x (P + W)

Torsional moment = ½ DP

Where P = unbalanced load, pounds
W = suspended weight of elevator, pounds
D = diameter of sprocket, inches

Expressing P (unbalanced load) and torsional moment in terms of factors most generally known, we have:

$$P = \frac{33.3 \times \text{tons per hour} \times \text{feet lifted}}{\text{feet per minute}} = 33000 \times \frac{\text{Horse Power}}{\text{feet per minute}} \text{ (Pounds)}$$

$$\text{Torsional moment} = \frac{63.6 \times \text{tons per hour} \times \text{feet lifted}}{\text{Revolutions per minute}} = 63030 \frac{\text{Horse Power}}{\text{R. P. M.}} \text{ (Inch Pounds)}$$

CHART 1

For a more exact determination of the size of shaft to be selected, it is advisable to figure both the torsional and bending moments. This especially should be done for heavy strains and for slow speeds. We give herewith the formulae for these moments as they occur in ordinary conveying and elevating work, and in the chart below the two moments may be combined for the selection of the shaft diameter.

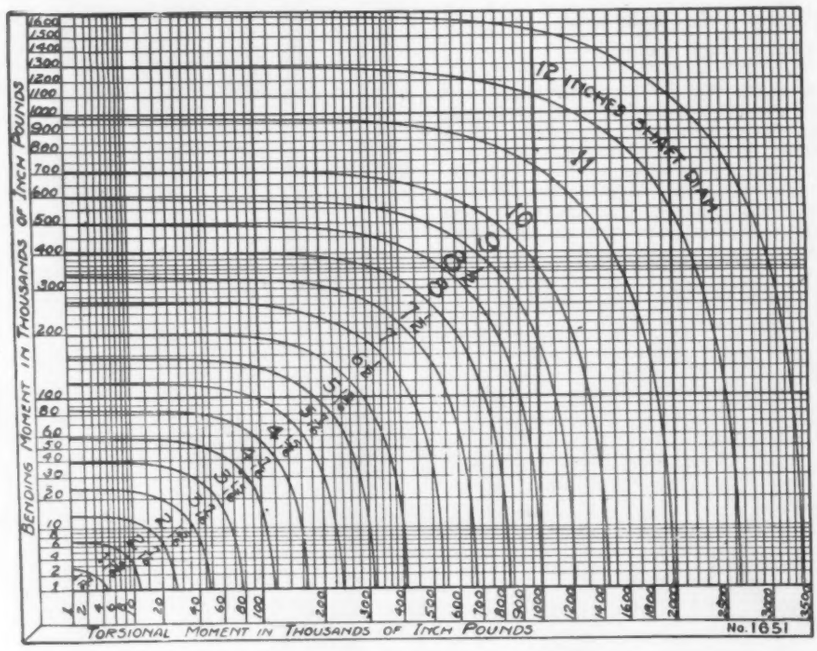


Chart based on a unit stress of 10,000 pounds per square inch.

The formula for combined bending and torsional stresses from "Merriman's Mechanics" from which this chart was plotted is as follows:

$$S = \tfrac{1}{2} S_b + \sqrt{S_t^2 + (\tfrac{1}{2} S_b)^2}$$

Resisting Bending moment = $S_b \times 0.098\ d^3$

Resisting torsional moment = $S_t \times 0.196\ d^3$

Where S = combined stress

S_b = stress due to bending

S_t = stress due to torsion

Sometimes it is desired to know the number of square feet in the face of a pulley. To find this proceed as follows: multiply the diameter of the pulley by 3.14 to get the circumference, multiply this result by the width of the pulley in inches, divide the result by 144 and the answer will be the number of square feet. Table 6 gives the horsepower transmitted by leather belts, and for estimating purposes this table will be nearly enough correct for all except special cases.

Belts never should be the full width of the pulley as a slight difference in alignment would cause the belt to run off the pulley and might cause destructive rubbing on the edge of the belt where a flange or other projection came in contact with it. On small pulleys single leather belts are best to use if they will carry the load. If the installation should indicate a single belt whose width would be more than 1⅓ times the diameter of the smallest pulley, it should not be used. A narrower light double belt would be the proper type to use. As a general rule double belts never should be used on pulleys of less than 12 in. diameter if it is possible to avoid it. A minimum of 20 in. would be still better.

Usually a belt which weaves back and forth on a pulley indicates one of two things: misalignment or a belt too heavy for the load. This condition is accentuated in the case of an intermittent load. When the belt is fully loaded it will run straight on the pulley, but if the load is reduced suddenly the belt will weave.

It is of fundamental importance that the belt tension be correct. A belt which is too tight creates excessive friction at the bearings and also overstrains and injures the leather. A belt which is too loose will jump off the pulley especially if the load is intermittent. Large belts have been known to tear down shaftings and hangers, due to being too slack and leaving the pulley. Up to a certain point the slacker a belt can be run and still carry the load the more economical it will be. Another factor to be considered is the fact that certain kinds of belting expand and contract due to changes in the weather. This applies particularly to chrome leather, and it is possible to burn out babbitt bearings and pull down shaftings if belts are put on too tight.

More belting is ruined by improperly lined shafting than any other one cause. Under this condition belts will be strained and usually will break apart on one end. This will cause the belt to run off the pulley and be torn apart. It should be kept in mind that because shafting was once in line it does not necessarily mean that it will remain so. Frequent inspection of line shafting should be made a rule of any installation and always will pay large dividends in belt economy. Most people seem to be under the impression that a belt drive consists simply of two pulleys placed in approximately a straight line with a band of leather stretched between them. Proportion, size and type of belting are given very little consideration, with the result that the installation is not based upon correct fundamental principles and therefore could never be a success from an economical standpoint.

The following simple rules will

assure the highest degree of economical operation for a line-shaft installation.

Place one man in charge of the belt drives and hold him responsible for the upkeep of the equipment. Furnish him with the necessary tools and replacement parts that will be needed in case of a breakdown. The duration of a shutdown depends upon the time spent in making the repair and this in turn is dependent upon the length of time needed to assemble the necessary repair parts. Give him a small room or at least a locker where he can keep these parts ready for instant use. (Remember a 10-minute shutdown with 60 men idle means a loss of 600 minutes, or 10-man hours of lost production.) He should make a careful inspection of each belt at frequent intervals and should look for the following defects:

1. Belt over-dry or oil soaked.
2. Too much belt dressing.
3. Laps have started to open up or connectors broken loose.
4. Too slack with consequent slipping.
5. Shafting out of line, loose hangers or worn bearings.
6. Belts badly worn and will need to be replaced.

Records should be kept of all belts, giving size, make, price and life performance.

The previous installment of this series gave instructions on figuring the horsepower of belts and stressed the fact that it was false economy to buy any but the highest quality of belting or to use a belt unfitted for the work it was desired to do. Very little time need be spent on the subject of line shaft hangers. The suppliers of this product usually are competent to furnish hangers of the proper design and strength for all the standard sizes of steel shaftings. Usually the question of selection is merely whether to use ball or roller bearings or babbitted type, ring oiling, self-oiling or grease-cup type.

The poor reputation that line-shaft drive has gained with some people usually is based upon hearsay or upon some unfortunate personal experience with a poorly designed layout.

In the first case the trouble begins immediately and continues until something finally gives way. In the second case the factor of safety is of course very desirable and future growth of the plant may justify the first cost. The cost of shafting is based upon weight per foot and a 3-7/16-in. shaft weighs twice as much as a 2-7/16-in. and three times as much as a 1-15/16-in. shaft. The hangers and supports and cost of erection will of course be greater as the size increases, so a standing investment in useless and unnecessary capacity is very seldom desirable.

Where a shaft unfitted for a particular installation has been specified it usually is found that the person making the layout did not understand the rule for figuring line-shaft capacity. This rule is based upon maximum demand and may vary through a large range, even in plants producing the same product. This demand factor is regulated by the method followed in the operation of the machines connected with the line shaft. Where most of the machines are in operation at the same time the demand upon the line shaft naturally will be greater than where only a small percentage of the group is working.

To determine the proper size of shaft it is necessary to know the horsepower-demand of each machine. This can be obtained from the firm supplying the machines. By adding together the horsepower-demand of the machines which are to be operated continuously we will obtain a base figure which will represent the minimum horsepower-demand on the shaft. By adding thereto the largest intermittent demand which will be made upon the shaft, we obtain the maximum load that the shaft will have to carry.

The proper size of shafting is regulated not only by the maximum demand as noted above but also by the torsional and bending stresses imposed by the heavier machines, especially at slow speeds. Three factors enter into the determining of these stresses: the weight of the pulley, the tension of the belt and the distance the pulley is placed away from the nearest hanger. It readily may be seen that with a heavy pulley the bending stress even with a slack belt, will increase very materially as the pulley is moved away from the supporting hangers. The maximum stress of course is reached at the center of the span. As an example of the effect of this bending stress on the capacity of a given size of shaft, let us consider a typical example. As was stated in the previous installment, "The effective belt tension is the difference in tension between the two sides." An example of this would be a belt where the speed was 3,500 ft. per min. with an effective tension of 76 lb. The capacity of the belt would be 8 hp.

It usually is estimated that the tension on the tight side of the belt will be about twice what it is on the slack side. In the example noted above the tension on the tight side would be 152 lb. and on the slack side would be 76 lb. If we assume 152 lb. as the weight of the pulley we have a bedding stress of 380 lb. In general practice a maximum of 8 ft. between hangers is about right. If we place our pulley half-way between hangers each hanger will carry one-half of the weight. The center distance will be 48 in. and the weight will be one half or 190 lb. The formula would be

190 (lb.) x 48 (in.)=9,120 in. lb.

It will be seen that the bending stress is increased with an increase in distance between hangers, even though the pulley weight remains the same. If we maintain our 8-ft. hanger spacing and place our pulley only 8 in. away from the nearest hanger, the result would be:

332.5 (lb.) x 8 (in.)=2,660 in. lb.

This example is given to explain the desirability of placing heavy pulleys as close as possible to the supporting hangers. Where there is an indication of possible excess stresses an extra hanger always should be provided to minimize these stresses as far as possible. Line-shaft deflection never should be more than .01 in. per ft. If this limit is exceeded very likely it will be the cause of broken pulleys, especially if they be of a cast-iron type.

The determination of line-shaft stresses will be more clearly understood by consulting Fig. 1 and chart 1 shown herewith. The captions explain the formula used.

Additional tables containing valuable information pertaining to line shafting will be given in the next article.

TABLE 6

Horsepower Transmitted by Belts

Single Leather Belting

Speed Ft. Per Min.	Width—Inches: 1	2	3	4	5	6	8	9	10	12	14	16
	Horsepower											
600	1	2	3	4	5	6	8	9	10	12	14	16
1,200	2	4	6	8	10	12	16	18	20	24	28	32
1,800	3	6	9	12	15	18	24	27	30	36	42	48
2,400	4	8	12	16	20	24	32	36	40	48	56	64
3,000	5	10	15	20	25	30	40	45	50	60	70	80
3,600	6	12	18	24	30	36	48	54	60	72	84	96
4,200	7	14	21	28	35	42	56	63	70	84	98	112
4,800	8	16	24	32	40	48	64	72	80	96	112	128
5,400	9	18	27	36	45	54	72	81	90	108	126	144
6,000	10	20	30	40	50	60	80	90	100	120	140	160

Double Leather Belting

Speed Ft. Per Min.	Width—Inches: 4	6	8	10	12	16	20	24	30	36	40
	Horsepower										
400	4	6	8	10	12	16	20	24	30	36	40
800	8	12	16	20	24	32	40	48	60	72	80
1,200	12	18	24	30	36	48	60	72	90	108	120
1,600	16	24	32	40	48	64	80	96	120	144	160
2,000	20	30	40	50	60	80	100	120	150	180	200
2,400	24	36	48	60	72	96	120	144	180	216	240
2,800	28	42	56	70	84	112	140	168	210	252	280
3,200	32	48	64	80	96	128	160	192	240	288	320
3,600	36	54	72	90	108	144	180	216	270	334	360
4,000	40	60	80	100	120	160	200	240	300	370	400
. .	50	75	100	125	150	200	250	300	370	450	500

BETTER MERCHANDISING

And Now — Electric Coffee

National Campaign for April Is to Feature the Percolator as the Necessary Companion of the Toaster

Percolators, by virtue of their elaborateness, distinctive appearance, and in some cases, cost, long have been looked upon by the average family as something of a luxury which would have to be postponed until the fabled ship came in. In a measure this circumstance has been the greatest sales resistance encountered by the merchandiser of those very useful, if sometimes ornamental, appliances.

But it is also true today that while there are still beautiful percolator sets, which the average family may look forward to owning in the sweet by-and-by, there are many inexpensive percolators which can be sold to bring home the use of this appliance as a perfect coffee-maker in the present "buy and buy." Once using an electric percolator, it is safe to estimate that no family will return to the coffee pot and that its next percolator may be the more elaborate one upon which it has fixed its hopes for so long.

Electric irons have come to be an accepted appliance. Few homes today are without them. The toaster, too, is coming into the same acceptance through persistent advertising and demonstration. The vogue for toasted sandwiches at the present time is an outgrowth of the advertising done on electric toasters. These sandwiches, electrically toasted, themselves are selling toasters where toasters never went before.

It is particularly interesting to notice, too, that electric percolators are beginning to be used in a like manner in commercial eating houses, displayed prominently as an advertising feature. This may be realized as the outgrowth of advertising of electric coffee-making.

So, with acceptance on the wave, now is the time to push percolator sales as never before. And because the percolator is not a spectacular appliance, this effort must be made ingeniously and persistently. A washing machine with plenty of action is an attractive piece of apparatus. A new electric refrigerator with its self-contained ice plant is likewise a spectacular piece of apparatus. The vacuum cleaner, too, is spectacular.

But it is well to remember that the iron, though quite an unromantic bit of mechanism, with no motion, no visible signs of action, has been sold in nearly every home in the country on its sheer usefulness. Even in foreign countries, where practically no other electric appliance is yet being sold, the electric iron has found a market.

The same must be accomplished for the percolator. It must be sold on its sheer usefulness and superiority to the old coffee pot, for it is as superior to the coffee pot as the electric iron is superior to the old sad-iron. Sales appeal must be based largely upon that fact.

Points to Feature in Selling Electric Percolators

There isn't a multitude of sales arguments to be used in percolator selling. The salient features of superiority can be counted on your fingers, but the same is true of the electric iron. These features must be hit hard and often. Their very terseness is something of an advantage for there isn't so much to sell to a customer that the effort may become dissipated. This about sums them up:

(1) Better Coffee—Its secret isn't so much in the brand used but in how it is made. Electrical coffee is coffee made in the very best possible way. It is percolated at just the right speed and heat to drain every drop of flavor from the coffee bean. Good coffee can be made better on an electric percolator.

(2) On the table, electrical coffee is made. And if one wants another cup it is right there, ready. There is no need to get up to go to the stove or to the kitchen. This is the convenience idea expressed in coffee.

(3) Quickness is another feature. The electric percolator is designed to prepare coffee in just the right amount of time, and that is surprisingly quickly. There is less chance of burning the coffee from too hasty preparation or of waiting too long for it to simmer.

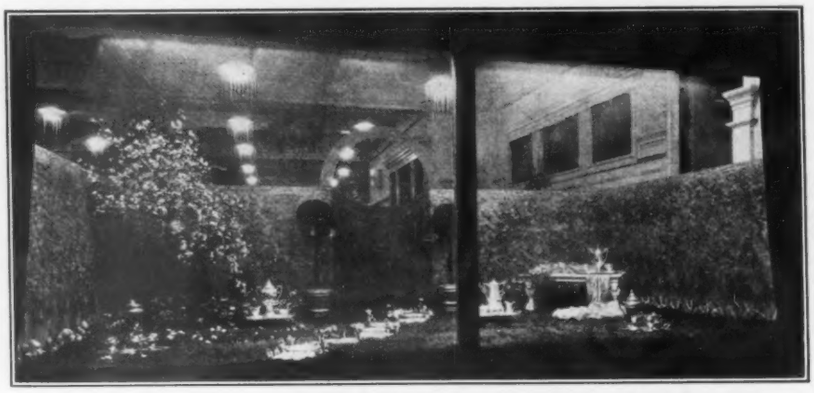
(4) It is clean. The electric percolator can be rinsed out with warm water and put away until it is used again. There will be no necessity for cleaning sooty coffee pots. This item appeals to any housewife.

(5) Ideal for entertaining. After the theater, or in entertaining visiting friends, the percolator provides a quick, clean means to present the present-day cup that cheers. The toaster is coming into its most prominent place as an aid to the hostess, and the waffle iron, too, is being used as the chef for many a bridge evening. For these the percolator is an indispensable ally. And the percolator which is used for these purposes to the best advantage is that which is accompanied by an appropriate creamer and sugar bowl.

What to Do 'Til the Order Comes

National advertising in all the leading home periodicals will announce the percolator campaign. Many of the jobbing and distributing agencies for these appliances also plan local campaigns of advertising. It would be well for the electrical merchandiser himself by his own advertising to point the way to the prospective customer as to where he may buy these appliances.

"Here is where you may get that percolator that you have been told of," his message may well be. He may make it as convenient for the pur-



Spring ushers in the percolator at the Public Service Company of Colorado, with this poetic Spring-like window display of percolator sets. The percolators vie with the flowers in this pretty garden scene. Reflected color in their shining nickel and silver surfaces makes them easily the most attractive things in the window.

chaser to buy his particular brand of percolator, when that customer is in the mood for one, as it is possible to do.

Window displays are necessary. In fact, if every store in town which handles percolators makes a display of these appliances at the same time—in April—no shopper will miss being reminded that this is the exactly right time to buy percolators. Whether the price is lower than ordinary or not, a concentration on percolators in April is sure to bring results.

Some central stations may start house-to-house campaigns. Even this should encourage the lone dealer, for experience has shown that when the central station makes a big advertising effort on some particular appliance every dealer in that territory sells more of those same appliances than at any other time. The stimulation given to the buying urge by the general campaign reflects to the benefit of all who merchandise.

Remember that the electric percolator is the natural companion of the electric toaster and the electric waffle iron. Where you can sell the one, a little extra sales effort will result in the eventual sale of the other two. If electrical coffee can be made a household word, the percolator will find itself in a class comparable with the electric iron.

Byllesby Merchandising Extends to Coast Properties Soon

Arrangements are already in process for the starting of merchandising by a number of Western Byllesby properties, according to a recent announcement in "Byllesby Management," made by J. W. Devereaux, assistant to the vice-president in charge of operations of the Byllesby Engineering & Management Corporation and especially in charge of merchandising. A start was made last year in the Oklahoma and Minnesota properties of the company. It is to be followed this year with merchandising activities first by the Western States Gas & Electric Company and later all other Western properties.

The Southern Colorado Power Company, Mountain States Power Company, Coast Valleys Gas & Electric Company, San Diego Consolidated Gas & Electric Company, Western States Gas & Electric Company and the California Oregon Power Company have arranged to expand their merchandising activities this year in accordance with Byllesby standards of store arrangements and merchandising and advertising methods.

In making arrangements to push the sale of appliances, especially electrical appliances for the home, it is not the intention to interfere in any way with activities of local dealers. Regarding this phase of the situation, Mr. Devereaux said:

"There were some dealers who were not in sympathy with the movement and it was necessary to let them know what our policy was going to be; but inasmuch as there is nothing new in our method for getting business from that which they might try, the dealers as a rule were satisfied after hearing our side of the question.

"As time has gone on we have had nothing but good news from the dealers. They report good business and some of them have stated that they have sold more appliances since we have been in business. These statements are now being checked up in the hope that this department can have definite information as to how they now feel about our merchandising efforts.

"Where the utility consistently goes about its business of selling appliances to customers, continually talking up the advantages of doing things electrically and advertising its wares, there will be considerably more appliance business for dealers than where the central station company is content to permit control of this important source of revenue to drift into the hands of those who care little about the quality of the goods they sell and still less about the interests of the customer or the utility. The central station industry in its need for more revenue per customer can ill afford to experiment with indifferent outside agencies for increasing its business."

The appliance sales department of the Byllesby organization has worked out a comprehensive set of rules covering standardization of equipment and methods. These rules form the basis on which merchandising activities will be carried on at all properties in the future.

Utility Opens Radio Sales Department.—A complete radio department has been organized by the Public Service Company of Colorado and placed under the direction of James Eakins, formerly one of the commercial representatives.

An Every-Day Percolator That You Will Use
$1.
For Your Old Coffee Pot
Announcing Our Second Annual
Electric Percolator Event
STARTING SATURDAY, MAY 16th--Featuring an 8-cup Pure Sheet Aluminum Electric Percolator--Complete with Plug and Cord--Remarkably Low Price--$5.75
The second of these extraordinary Percolator Events—featuring an improved Pure Sheet Aluminum Electric Percolator in the 8-cup size. A far better value than the one offered last year. Improvements and refinements have been added, but price and terms remain the same.
BUT YOU ACTUALLY PAY ONLY
$4.75
IF YOU BRING AN OLD COFFEE POT
The most delicious coffee can be made in this percolator right on the table before you. Think how convenient it is. It's aluminum and will not tarnish.
Don't Pass This By—Buy Now!
SHOWING 1000 OLD COFFEE POTS WHICH WERE TURNED IN DURING OUR GREAT PERCOLATOR SALE LAST YEAR
It's the Best Value We Ever Offered in a Percolator
Easy Terms
You only have to pay One Dollar, and turn in an old Coffee Pot for One Dollar, the balance of $3.75 may be paid in three equal Monthly Payments of $1.25 each.
Sale Starts Saturday, May 16th, at 8 a. m. Sharp.
VALLEY ELECTRICAL SUPPLY CO.
PHONE 3397 FRESNO SAN JOAQUIN POWER BLDG
All Mail Orders Shipped Prepaid
BRING an OLD COFFEE POT

Again looking to the Valley Electrical Supply Company of Fresno for a telling sales idea, one comes upon this effective broadside and advertisement used in a percolator campaign last year.

NEWS OF THE INDUSTRY

Further Details of Denver's Municipal-Ownership Plan

Supplementing the announcement of the proposed plan to introduce municipal ownership into Denver (Journal of Electricity, March 15, 1926, p. 234) additional details of the project have been received from that city. The proposal to utilize the waters of the South Platte River for a municipal water supply and hydroelectric generation was made by the Fargo Engineering Company of Jackson, Mich., James H. Causey, financier, and the engineering firm of Wood & Webber, Denver.

As a result of the introduction of the Two Forks project into the Denver water-supply situation and the criticisms over the arrangements being made by the water board to utilize the pioneer bore of the Moffat Tunnel for bringing water to the city, three recently appointed members of the water board have resigned. They are Ernest Stenger, president of the Denver Tramway Company, F. W. McCartney, capitalist, and Sam Perry, coal-mining magnate. These men had been appointed by Mayor Stapleton to iron out the water-supply situation.

The attitude of the Public Service Company of Colorado, whose franchise in the city of Denver expires May 15, 1926, has not been expressed. The proposal calls for the purchase of the energy output from the proposed hydro stations by the utility company.

To supplement the work of H. B. Dwight, electrical engineer of the Colorado Utilities Commission, who has been loaned to the city to make a valuation of the properties of the Public Service Company before a franchise agreement is reached, the city has retained Rae Palmer, New York electrical engineer, in a consulting capacity. Mr. Palmer will supervise the work of checking the valuations of the utility's property to be used as a basis for rates to be decided by the franchise.

Power Company Orders Equipment for Buck's Creek Plant

Orders have been placed by the Feather River Power Company for power house equipment to be installed in its Buck's Creek plant where water will be utilized under 2,350-ft. effective head, the highest head yet developed in this country.

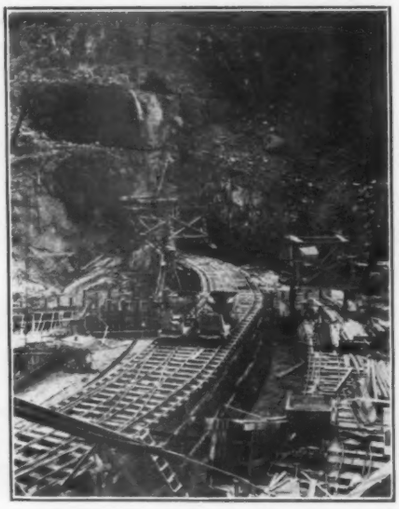
The hydraulic equipment is to be designed, built and installed by the Pelton Water Wheel Company of San Francisco, and will consist of two 35,000-hp. double-overhung impulse turbines complete with governor actuators, oil-pressure system, hydraulic cylinder-operated gate valves and other auxiliaries. Two impulse wheels of 450-hp. capacity each also will be furnished for driving the exciter units. Each turbine will be direct-connected to a 25,000-kva. generator, these to be furnished by the General Electric Company, whose contract covers all the electrical equipment for this plant. The entire plant output will be purchased by The Great Western Power Company of California. (Journal of Electricity, Oct. 1, 1925, p. 265).

Grays Harbor Company Remodels Aberdeen Headquarters

A public reception recently celebrated the completion of the remodeling of the headquarters of the Grays Harbor Railway & Light Company at Aberdeen, Wash.

The offices of W. W. Briggs, vice-president and general manager, and the heads of several of the departments, which were located at the back of the second story, have been moved to the front part of the building. The walls of all the offices and the hallways have been retinted, the woodwork has been repainted and the lighting fixtures modernized.

Federal Light & Traction Company Buys New Mexico Utility.—The Federal Light & Traction Company, New York City, has acquired the property and franchises of the Santa Fe Light & Water Company, Santa Fe, N. M. J. H. Bowles of the New York office of the company, and Arthur Prager, manager of the Albuquerque Gas & Electric Company, completed negotiations recently. Before the deal is completed the new company will ask for a vote of ratification by Santa Fe citizens.



The Melones project of the Oakdale and South San Joaquin Irrigation District as it appeared March 4, 1926.

Doherty Company Buys Colorado Utility Properties

Another string of utility properties shortly will be added to the Public Service Company of Colorado as the result of an agreement by Henry L. Doherty & Company to purchase the Grand Junction Gas & Electric Light Company, the Grand Junction Ice Company, the Palisade Light Company, and the Grand River Valley Railway Company, operating an electric interurban line between Grand Junction and Fruita, on the western slope of Colorado.

The central station at Palisade formerly was owned by the Hendrie & Bolthoff Manufacturing & Supply Company of Denver and was purchased by the owners of the Grand Junction properties about two years ago. These properties were controlled by a group of Colorado Springs capitalists headed by A. E. Carlton, president of the Holly Sugar Corporation, which maintains a large beet sugar factory at Grand Junction.

The Public Service Company will take over the Grand Junction properties about May 1, it is reported. In the meantime it is understood that negotiations are being conducted by the company for several municipally owned plants which will be added to the lines in accordance with the company policy to acquire desirable independent units adjacent to its territory.

Edison Company Orders Impulse Units of Record Capacity

Orders recently were placed by the Southern California Edison Company, Los Angeles, for two 56,000-hp. impulse units, which are said to set the world's record for capacity. They exceed by 16,000 hp. each the two 40,000-hp. impulse units installed in the Serra plant of the Sao Paulo Tramway, Light & Power Company of Sao Paulo, Brazil, that previously claimed the record. The impulse unit of highest capacity yet installed in this country is a 35,000-hp. unit in the Edison company's Big Creek No. 1 plant. This equipment, as well as that installed in the Serra plant, was designed and built by The Pelton Water Wheel Company, San Francisco.

The two 56,000-hp. units just ordered will be built by The Pelton Water Wheel Company and the Allis-Chalmers Manufacturing Company, Milwaukee, respectively, and will be installed as the first equipment in the Big Creek No. 2A plant, whose ultimate capacity is planned to be 300,000 hp. Both units are to be essentially identical, the normal effective head to be 2,200 ft., static head 2,420 ft., and the normal speed 250 r.p.m. for 50-cycle operation. Provision is made in each unit to permit 60-cycle operation at 300 r.p.m.

Power Project in Willapa Harbor District, Wash., Planned

Announcement of a $1,540,000 electrical water-power project in the Willapa Harbor district that when completed will generate 10,000 continuous electrical horsepower, was made recently with the filing of water and reservoir applications at Olympia, Wash., by J. R. Snider of the Willapa Electric Company.

The storage in the natural reservoir of 272,000 acre-ft. of water will mean the submerging to an average depth of 60 ft. of 5,440 acres of land situated near Conto, eight miles northwest of the town of Raymond, according to information furnished R. K. Tiffany, supervisor of hydraulics. The project will reqquire a dam 125 ft. high. The appropriation asked is 5,000 sec.-ft. of water from North River, which will be tapped at a point 150 ft. from the power plant proper.

Actual work of construction can be started April 1, 1927, provided the permit is granted, and should be completed not later than Jan. 1, 1929, it was said.

Colorado Utility Leases New Offices in Pueblo

A lease for offices in the new Colorado Building, to be erected at the corner of Fourth and Main Streets, Pueblo, has been signed by the Southern Colorado Power Company, which will occupy a portion of the main floor.

The new quarters will have a frontage of 30 ft. on Main Street and this section will be occupied by the cashier's and service departments, together with the merchandising department. Behind these departments will be located the clerical department and the executive offices. The entire frontage on Fourth Street will be occupied by the power company. Plans contemplate provision for space in the basement for the use of churches and charitable and civic organizations for bazaars and similar functions.

The Southern Colorado Power Company, which is a Byllesby holding, serves fifty-six cities and towns with a total estimated population of 100,000.

Pacific Gas and Electric Wins Decision in Suit

Applications for injunctions filed by the Market Street Railway Company against the Pacific Gas and Electric Company, both of San Francisco, to prevent the latter from collecting $425,000 and accrued interest from the former have been dismissed by the federal court.

The filing of the injunction pleas followed the decision rendered by Judge Walter Perry Johnson of the superior court in the original suit brought by the railway company against the power company in a dispute over rates for electric power fixed by the California Railroad Commission (Journal of Electricity, Feb. 1, 1925, p. 112). The railway company contended that increases allowed by the railroad commission over rates stipulated in a certain agreement existing between the two companies were illegally authorized as the power supplied under the contract never became a public utility because the contract was private, thus barring the commission from jurisdiction. Judge Johnson ruled in favor of the Pacific Gas and Electric Company.

The decision rendered by Judge Hunt of the United States Circuit Court and Judges Kerrigan and St. Sure of the United States District Court says in part:

> Plaintiff's rights are to be measured solely by the external limits of "due process," and if there is no allegation that the commission transgressed those limits it has no standing in federal court; for here only constitutional questions may be considered. * * * * The increases first made were temporary, were measured by accurate gages of increases, and were followed within a reasonable time by a rate based on full and complete valuations of the properties involved, which demonstrate their essential fairness.

Northwestern Company Seeks More Water from Elwha River

Enlargement of the originally outlined plans having been decided on, the Northwestern Power & Light Company, of Port Angeles on the Olympic peninsula, Washington, has filed additional applications with the office of the state supervisor of hydraulics in Olympia seeking reservoir rights and an additional appropriation of 200 sec.-ft. of water from the Elwha River.

Through permits previously issued (Journal of Electricity, July 1, 1925, p. 35) the company was given a 600-sec.-ft. appropriation which apparently has proved insufficient in estimating for the plant, which now is estimated to cost $1,000,000 and is expected to be started prior to March 1, 1927. The total output of the plant is estimated at 16,500 continuous electrical horsepower. The reservoir under the application just made would store 50,000 acre-ft. of water and would be headed by a concrete dam 200 ft. high.

Walla Walla, Wash., Names Commission to Investigate Feasibility of Municipal Plant.—A city rate commission has been named by the city of Walla Walla, Wash., to investigate and report upon the feasibility of a municipally owned power and light plant and distribution system for the city. The city commission brought about a hearing before the department of public works, held in August, when Walla Walla and neighboring communities joined with Yakima in asking rate reductions from the Pacific Power & Light Company. Neither the city commissioners nor the rate commissioners are satisfied that the results of the hearing will afford the desired relief and consider a municipal plant the only recourse.

Option on Power Site Bought by Great Northern Railway

The Great Northern Railway advised the Washington state hydraulics office early in Februray that it had purchased for $35,000 an option for a water-power site that upon completion of development will furnish an output of 35,000 continuous electrical horsepower for use in hauling its transcontinental trains through the 3½-mile Cascade tunnel. The site in question is 8 miles from the town of Scenic.

Plans include a concrete dam 100 ft. high and a conduit 3½ miles long to carry the water to the power house. The site carries with it diversion rights to 300 sec.-ft. of water. Construction is expected to be started within the next three months.

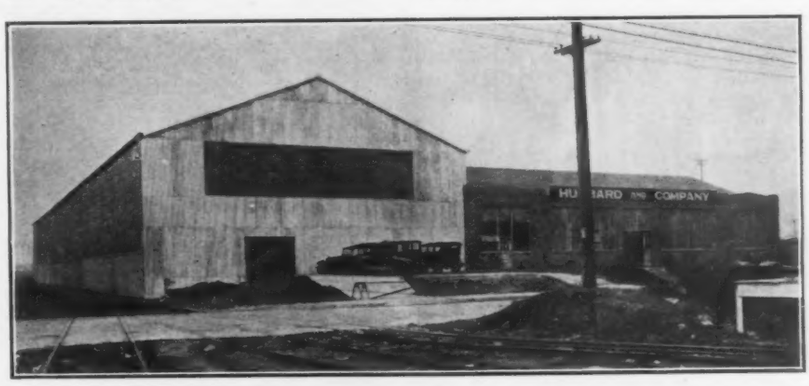
New Unit Added to Emeryville Pole-Line Hardware Plant

A new unit has been added by Hubbard & Company of Pittsburgh and Chicago to their plant at Emeryville, Calif. The concern, a large manufacturer of pole-line hardware and construction specialties, erected the first unit about a year ago, and the second unit now doubles the capacity of the plant for the manufacture of pole-line hardware. The Austin Company of California built both units.

Hubbard & Company's site occupies about six acres with a frontage of about 337 ft. on 45th Street between San Pablo Avenue and Hollis Street. The property extends 380 ft. along the Southern Pacific industrial track serving the district.

New construction occupies an area of about 205 x 170 ft., extension having been made to the yard storage building and improvement work carried out on the balance of the lot in the rear of the forge building. A crane runway aisle 40 ft. wide carrying a 5-ton crane has been constructed across the rear of the property extending a distance of 170 ft. The galvanizing and storage building is of brick and steel construction of saw-tooth design to afford ample light and ventilation. The front elevation on 45th Street is faced with brick to conform with the present strucure. A railroad loading plaform and a new entrance for trucks has been provided.

It is expected that other units will be added to the Emeryville plant and that ultimately all the company's other products also will be manufactured there.



The plant of Hubbard & Company at Emeryville, Calif., to which a new unit recently has been added.

News Briefs

West Fork of Kings River Excluded from San Joaquin Power Corporation's Development Project Permit Until Storage Rights Acquired.—The license issued the San Joaquin Light & Power Corporation covering a development on the North and West Forks of Kings River has been amended so as to exclude the West Fork from the project until storage rights have been secured. The addition of an upper development on the North Fork has been added to the project with the approval of the Federal Power Commission.

Doherty Company Acquires Independent Central Station at Brighton, Colo.—The acquisition of another independent central station by Henry L. Doherty & Company has been announced in the purchase of the Brighton Ice, Light & Power Company, Brighton, Colo. This company, which serves a prosperous agricultural community about twenty miles from Denver, has been operated for about fifteen years by M. R. Quinn and will be transferred to the Public Service Company of Colorado. Mr. Quinn and associates have incorporated a new company to continue operation of the ice and coal business.

Los Angeles Creates Street Lighting Department.—Street lighting problems have been found to occupy so much time that the city council of Los Angeles, Calif., has created a new department of city government to handle them. The new department is to be known as the street lighting department and is to work under the direction of the board of public works.

Denver League to Investigate Electric Traffic Control Systems.—Two special committees have been named by the Electrical League of Colorado to investigate and make a report on the electric traffic control signal systems which are being considered for installation in Denver. One committee is headed by Ernest P. Kipp with D. D. Sturgeon, A. E. Bacon, and R. G. Gentry. The other committee consists of Thomas W. Nixon, F. F. McCammon and Fred E. Staible.

Puget Sound Company Buys Avery Public Utilities.—Purchase by the Puget Sound Power & Light Company of Seattle of all the property of the Avery Public Utilities, consisting of the electric light and power distribution systems of Pe Ell, Lewis County, Wash., has been announced. The systems consist of seventeen miles of transmission and twelve miles of distributing line. These utilities have been purchasing their supply of current from the Puget Sound company.

Utility Incorporated in Centralia, Wash.—The Centralia Power & Light Company, Centralia, Wash., has been incorporated for $50,000 by R. F. Hubbard, W. H. Copping, and C. D. Cunningham.

Northwest Electric Light & Power Association

Valuable Data Characterize Papers of Technical Section

Replete with technical material of particular importance to utility operation in the Northwest, the third annual general meeting of the Technical Section of the Northwest Electric Light and Power Association at Seattle, March 11-12, 1926, passed into history with a record attendance and a feeling of enthusiasm equaling that of past years. One hundred and fifty-one section members registered during the two-day session, and many took part in the presentation of twenty-odd papers on technical subjects and in the discussion on these subjects, which was necessarily short on account of the fullness of the regular program. Two features of the meeting were the presence of Col. William Kelly, director of engineering, N. E. L. A., New York, who addressed the meeting the first day on the work of his department of the national organization, and a remarkable address by Franklin T. Griffith, president, Portland Electric Power Company, Portland, on the "Relation of Public Service Men to the Public," published elsewhere in this issue of the Journal.

After the meeting was called to order by Z. E. Merrill, assistant general manager, Mountain States Power Company, Albany, Ore., chairman of the section, W. H. McGrath, vice-president, Puget Sound Power & Light Company, Seattle, welcomed the visitors, calling attention to the place of the engineer in the business, and saying that when the public comes to know more about the business it will focus greater attention on the work of the engineer. The response by Lewis A. Lewis, sales manager, The Washington Water Power Company, Spokane, and president of the association, expressed gratification at the work of the technical section which, he said, always had been one of the most conscientious of all the sections in the way in which it attacked its problems.

The accomplishments of the joint committee from the N. E. L. A. and American Telephone and Telegraph Company on inductive co-ordination formed the principal theme of the talk of Colonel Kelly, who was introduced at this point, though he spoke in part on the work of his department in connection with consolidating and co-ordinating the efforts of the various committees working on code revision.

Co-operation with Regulatory Bodies Theme of Address

The feature of the program of H. J. Flagg, assistant to the general manager, Grays Harbor Railway & Light Company, Aberdeen, Wash., chairman of this committee, was a talk by Claire Bowman, director of labor and industries, State of Washington, Olympia. He stated that the power companies were interested in his department from three standpoints: accident prevention and cost, insurance cost, and public attitude. Saying that the department should be called an advisory body rather than a regulatory body, he impressed his auditors with the fact that his department wanted to help industry and expected the co-operation of industry.

Accident Prevention

J. B. Fisken, consulting engineer, The Washington Water Power Company, chairman of this committee, introduced as the first speaker M. E. Arkills, safety engineer, Water Front Employers, Seattle, whose subject was "The Economic Value of Accident Prevention." He showed some of the dollar-and-cents savings that could be effected through intelligent application of safety-first principles in an industrial enterprise, citing four companies that reduced their direct accident compensation costs during the period 1920 to 1923 an average of over seventy-six per cent. Some less tangible costs of accidents are: labor turnover, stoppage of work or service, lowering of morale and efficiency, and increased overhead.

"Selling Safety" was the subject of a paper by G. I. Drennan, field superintendent, Pacific Power & Light Company, Walla Walla, Wash., in which he said it was necessary in starting a safety program to begin at the president and sell every man and woman from there down. He said that the approval of the executives was necessary to get the money to carry on an educational program, which is a necessary part of any company's accident-prevention methods, and that the prosecution of such a program required the application of sales methods.

General discussion took up the necessity of installing certain safeguards on equipment which H. H. Schoolfield, chief engineer, Pacific Power & Light Company, Portland, said should be designed before construction, with the design submitted to the safety engineer for his suggestions before approval. H. A. Patton, electrical engineer, Washington Surveying and Rating Bureau, Seattle, called attention to the relation of life hazard to fire hazard, urging that in the zeal to protect the former one should not unduly increase the latter.

Inductive Co-ordination

Again the most interesting subject of this committee's work was the continued study of power company influence on radio reception, though Colonel Kelly's reference to the work

of the national committee called forth some supplementary remarks from the chairman, G. E. Quinan, chief electrical engineer, Puget Sound Power & Light Company, relating to the work of that committee on the relations of power and telephone lines. The subject of relations with radio reception was opened by E. F. Pearson, electrical engineer, Northwestern Electric Company, Portland, who read a paper prepared by L. H. Kistler, supervisor of meter department of that company, on "Radio Interference from the Power Company's Standpoint." Six causes of radio interference were listed in the order of their importance as follows: interference from various types of radio receivers; too many broadcasting stations operating coincidentally; customers' appliances and devices on power company lines; natural causes; lines and apparatus of power companies; and commercial or ship spark stations. Stating that the present system in many localities of asking the power companies to investigate all radio trouble placed an unfair burden on them, he suggested that a central clearing house for such complaints should be conducted by a broadcast listeners' association which should investigate complaints and turn them over to the proper agencies for clearance.

O. R. Redfern, supervisor of radio for the seventh district (the Northwest), next on the program, told of some of the complaints with which his office had to deal, citing the various types of medical machines in doctors' offices as being among the worst offenders. Such interference has been eliminated successfully by encasing the room in which the machine is situated with a fine-meshed, galvanized-iron wire-netting and then grounding this netting. Smelter interference has been reduced to a minimum by placing choke coils in each end of the precipitator lead. Atmospheric disturbances have caused much interference during the past winter.

Hydraulic Power

Opening the afternoon session, O. L. LeFever, superintendent, Northwestern Electric Company, chairman of this committee, made a brief survey of the more recent hydroelectric developments on the Pacific Coast, citing data collected by the Journal of Electricity, and immediately thereafter introducing Lyman Griswold, consulting engineer, Portland, to present a paper on "Rock and Earth-Fill Dams." Urging that engineers be not prejudiced in favor of any one type of dam to the exclusion of all others but that they approach each project with open-mindedness, Mr. Griswold asserted that some projects, economically not feasible if concrete is used, can be developed with the use of rock and earth-fill dams well within the accepted economical limit of cost per horsepower. He cited numerous cases of such structures built in India, Egypt and Ceylon, before Christ, stating that these are still in service and that the failure of such structures is practically unknown.

Invited in for the purpose of discussing this paper, S. H. Hedges, Puget Sound Bridge & Dredging Company, Seattle, told of two jobs in Texas secured by his company, both of which involved large earth and rock-filled dams. Material was secured by dredging from the river bottom.

Contending for a broad conception of all the economic problems of the entire system, the paper by C. P. Dunn, designing engineer, Portland Electric Power Company, on "The Economies of Hydroelectric Design," showed that the following fundamental studies should be made before attempting to determine the size and type of a hyroelectric plant to fit into an existing system: rating of existing system, load forecasting, determination of general construction program, determination of general features of the individual project, and value of the power. The relation of each of these to the needs of the existing and prospective system was discussed in order.

Apparatus

In the absence of Walter Hendron, engineering department, Utah Power & Light Company, Salt Lake City, who was to have presented a paper on "Mechanical Troubles with Late Types of Oil Circuit Breakers," D. W. Proebstel, superintendent of tests, Portland Electric Power Company, chairman of the committee, recited excerpts from answers received to a questionnaire sent to member companies on the subject. The principal defects in certain types of breakers were found to be insufficient oil drains, oil leaks, faulty closing and tripping mechanism, and inaccessible parts. Suggestions for improvement were offered. Discussion later, led by C. W. Fick, General Electric Company, Portland, and C. E. Carey, Westinghouse Electric & Manufacturing Company, Seattle, brought out the fact that some of the defects mentioned occurred only in old-type breakers and had been eliminated in the later types, and that the manufacturers were always ready to receive constructive criticism from the field for the purpose of obtaining data to be used as a basis for improving the apparatus offered to the user.

In a paper by R. Rader, assistant engineer, central district, Puget Sound Power & Light Company, Seattle, the subject of differential protection and neutral grounding of generators and transformers was discussed. The two principal advantages of grounding the generator neutral were noted to be the protection of the generator against high-voltage disturbances due to grounds and short circuits on the transmission system, and protection against internal faults, as phase-to-phase short circuit and the grounding of a winding . Reports from member companies disclosed that a number of different practices were in use.

Interesting from the commercial angle as well as the technical was the paper on "New Electrical Applications in the Paper Industry," by C. W. Fick, General Electric Company, Portland. Stating that the paper industry uses 71,000 hp. in Oregon and Washington alone, he explained the electric steam boiler, the Alexander dryer for drying the paper as it passes over cylinders, electric flow meters for measuring the steam and water used in different processes, revolving-frame synchronous motors on beaters, the double frequency, super-calender drive to give a one-tenth speed for threading the paper through the rolls, and the sectional drive maintaining uniform speed on all the sections of the paper machine. Mr. Fick's remarks were supplemented by C. R. Vicary, Washington Pulp & Paper Company, Port Angeles, Wash., and G. A. Frogner, Crown Willamette Paper Company, Portland, who told of experiences with the equipment mentioned, closing the first day's session.

The program of the Friday session opened with the address of Mr. Griffith, which is covered in another department of this issue, as is stated above.

Overhead Systems

First on the program of this committee was the reading by F. O. McMillan, associate professor of electrical engineering, Oregon Agricultural College, Corvallis, of the final report on the tests on 13-kv. to 17-kv. insulators as carried on in the laboratory of that institution (Journal of Electricity, Oct. 15, 1924, p. 302, and May 1, 1925, p. 338). Of the five manufacturers giving catalog ratings

Delegates to the third annual general meeting of the Technical Section, Northwest Electric Light and Power Association.

for dry flashover, three gave voltages lower than showed in the test, and two higher. The test showed results from 17.85 per cent higher to 5.8 per cent lower than the catalog ratings for dry flashover. Because of a breakdown of the high-voltage equipment, no tests on insulators above a normal rating of 17-kv. can be tested.

In the discussion H. H. Schoolfield told of the movement on foot to procure new high-voltage equipment for the laboratory of this college. He further outlined the purpose of the tests, begun in 1924 at the instigation of the committee, as being not so much to question the ratings given by manufacturers as to reach a common basis for giving specifications uniformly.

Practices in live-line maintenance work of the Idaho Power Company, Boise, were told in a paper by T. A. Purton, office engineer of that company, but read in his absence by F. J. Rankin, chief engineer. Changing insulators on a 66,000-volt line, which it is not practicable to kill, has been accomplished safely and successfully by the use of tools manufactured by the W. T. Safety Tool Company, Inc., Decatur, Ill. This maintenance has been considered only temporary, and it is the intention, at a time when the line may be killed, to make permanent the ties on the insulators changed. Discussion centered around the use and testing of rubber gloves for low-tension work, it being the consensus of opinion that gloves should be tested periodically.

The question of the life of treated and untreated poles, which has been assigned to this geographic division by the National Overhead Systems Committee, was next brought up for discussion by J. B. Brokaw, chief engineer, Eastern Oregon Light & Power Company, Baker, Ore., chairman, asking for an expression from members present as to the feasibility of undertaking this study. The ensuing statements disclosed that few companies have adequate records of old poles but many are now keeping a record of those recently set with the view to observing their performance. A motion introduced by S. C. Lindsey, engineer, central district, Puget Sound Power & Light Company, that the section go on record as favoring the keeping of an accurate record of the life of poles for future report, was passed.

Meters

"The Calibration of Meters and Instruments" was the subject of a paper by A. H. Kreul, foreman of meter department, Portland Electric Power Company, read in his absence by J. C. Henkle, superintendent of electrical maintenance and construction of that company, in which he discussed the standardization of instrument and meter practice, showing how all instruments could be kept in calibration. The need for this standardization was stressed by citing the case of two utilities distributing energy between each other, having occasion to compare their rotating standards and finding an error of two per cent between the two instruments with no record of a corrective error or calibration curve in either case.

L. D. Snow, general meter foreman, Puget Sound Power & Light Company, then discussed the selection of instrument transformers for use with watthour meters, making a technical analysis, illustrated by charts, of the causes of discrepancies in the measurement of power through the use of current and potential transformers. The effects of opening the secondary circuit of current transformers, and of changing the burden on the secondary windings, were taken up from the standpoint of selecting the proper type of instruments for any given set of conditions.

The experience of this company with the use of the distant dial for securing a simultaneous demand on several scattered loads also was discussed by Mr. Snow, and a paper on this subject is to be written and included in the record of the proceedings of the meeting.

Underground Systems

Setting forth some of the difficulties encountered in operating underground equipment, J. M. Gillham, superintendent of underground department, Portland Electric Power Company, made suggestions for the improvement in secondary junction boxes, secondary oil switches, transformers, and oil fuses. He also suggested that more research work be done on underground problems and that the findings be published for the benefit of men engaged in this department of the business.

"Manhole Ventilation" was the subject of a paper by S. B. Clarke, superintendent of underground department, Northwestern Electric Company, in which he showed the deleterious effect of excessive heat on transformer and switch oil, cable insulation, and lead sheath, and explained how proper ventilation could be secured by natural or mechanical means. He explained how external factors, such as nearness to steam mains, had considerable bearing on the amount of heat that would be dissipated by radiation from the vault walls, and how increases in peak load or lengthening of the hours of the peak carried by the transformers in a vault might make necessary forced ventilation by fan.

Prime Movers

Stating that his committee was undertaking studies of particular interest to companies in this geographic division, C. C. Simral, assistant superintendent of steam plants, Portland Electric Power Company, chairman, first called on W. S. Hill, general superintendent, Grays Harbor Railway & Light Company, for his paper on "Equipment for Handling Hog Fuel." After referring to several different systems in use among Northwest companies, Mr. Hill described the high-pressure, long distance, pneumatic conveying system in operation in the plant of the Long Bell Lumber Company, Longview, Wash. Two separate systems, each consisting of fan and charger driven by a 500-hp. synchronous motor, and the necessary piping and dust collectors, convey the waste fuel from the mill through two pipes 2,600 ft. long to the fuel storage.

H. S. Bastian, manager, Charles C. Moore & Company, Portland, next explained by the use of blackboard drawings the merits and demerits of different types of grates and feeds for burning hog fuel.

"The Operation of Mechanical Soot Blowers on Hog-Fuel Fired Boilers" was the subject of a paper by Tom Perry, superintendent of steam stations, Northwestern Electric Company, read in his absence by O. L. LeFever, in which was presented a cost analysis of the efficacy of blowing tubes by mechanical blowers. A questionnaire had been sent to paper mills, saw mills, and public-service companies of the Northwest using mechanical blowers, with the idea of determining what had been the success in saving fuel through their operation. The answers revealed a variety of opinion and a wide variation in results, but indications were that the blowers had not been a good investment.

The efficacy of different kinds of packing for centrifugal pump shafts and turbine control valve stems was discussed in a paper by W. C. McLagan, steam superintendent, Mountain States Power Company, Springfield, Ore., in which the conclusion was reached that all kinds have some defects, and that in the present stage of development no packing has yet been constructed that will give the service one would like to see.

The last paper on the program was on "The General Trend of Heat Balance Control in the Northwest," by R. S. Carroll, assistant engineer, Portland Electric Power Company. Describing the plant operation of one company which lately has worked out a dual-drive exciter set for controlling the heat balance, and stating that a second company is planning to use steam-driven auxiliaries with a new 20,000-kw. steam unit, he concluded that the general trend is toward the use of steam drive for auxiliaries for heat balance control. No time was left for discussion of the papers of this committee.

Resolutions were passed thanking the Puget Sound Power & Light Company for the arrangements made for the meeting, the Olympic Hotel for the use of its facilities, and the Seattle newspapers for the publicity given. The entertainment Thursday night included a banquet and theater party, while several trips to interesting places were arranged by the Puget Sound company. Entertainment also was provided for the visiting ladies.

Northwest Convention Dates Changed to June 14-17

The annual convention of the Northwest Electric Light and Power Association will be held in Spokane June 14-17 instead of June 16-19, as previously stated. The change has been made necessary by the fact that two other conventions scheduled for the same dates as the association's convention will bring to Spokane about 1,500 visitors with less than 500 rooms available in first and second-class hotels. In order to assure any accommodations at all, officials of the Northwest association deemed it necessary to set its convention date ahead.

Because accommodations will be at a premium, it is vitally important that members of the electrical industry outside of the Northwestern district who intend to attend the convention of the Northwest Electric Light and Power Association make hotel reservations immediately.

Pacific Coast Electrical Association

Transportation Section Studies Motor, Personnel Problems

Several papers on transportation problems in phases as widely separated as mechanics and personnel were read and discussed at the meeting of the Transportation Section, Pacific Coast Electrical Association, held in San Francisco, March 12-13.

Among the papers presented were: a questionnaire on selection of automotive equipment, by C. D. Weiss; Educational Methods, by W. M. Fairbanks; Automotive Records and Accounting Practice, by J. S. Moulton; Repair Shop Methods and Equipment, by V. W. Dennis; Lubrication, by E. C. Wood; and Electric Trucks, by W. E. Gallemore.

A committee, consisting of Messrs. Ducker, Fairbanks, and Mason was appointed by Chairman S. B. Shaw of the section to report at the next meeting at the convention in June on a classification of positions in member company shops, such as mechanics, drivers, chauffeurs, helpers, etc. This committee is to submit a definite outline also.

Mr. Weiss made a motion, subsequently carried, that the chairman appoint a representative from the section to go to the meeting of the truck operation subcommittee, Commercial Section, N. E. L. A., which is to meet in Boston June 28-29.

Messrs. Ducker, Fairbanks, and Weiss were appointed to a committee to prepare a program for the meeting of the section at the June convention. At this meeting four papers are to be presented, namely, Tires, Power Equipment and Labor-Saving Devices, Truck and Commercial Body Design, and Garage Design. The chairman suggested that members of the section co-operate with the electric truck committee of the Commercial Section, and that, if possible, the program committee endeavor to arrange the program at the convention to facilitate a joint meeting.

Schedule of Technical Conclave Meetings Announced

Details of the meetings of the technical conclave of the Pacific Coast Electrical Association, to be held in Fresno, Calif., April 7-9, have been announced by R. R. Cowles, chairman of the Technical Section, as follows:

Headquarters: Hotel Fresno. Make reservations direct with the hotel, mentioning the Pacific Coast Electrical Association.

Meetings: San Joaquin Power Building.

Purpose of Meetings: Reports of delegates to Kansas City group meetings, transaction of regular business, reports of subcommittees, discussion and preparation of final reports.

Luncheons: The luncheon Wednesday will be a joint meeting with the American Society of Engineers. At the Thursday luncheon the committee chairmen and delegates will report on the Kansas City meetings, and Mr. Baurhyte will be the speaker.

Trips: Arrangements have been made for a trip on Saturday, April 10, to the Balch project of the San Joaquin Light & Power Corporation, now under way. If desired, a trip may be made to the Big Creek plants of the Southern California Edison Company, leaving Fresno on train Saturday morning at 8 o'clock, returning Sunday evening to Fresno, arriving 6:30 p. m.; or, as an alternative, automobile trips may be arranged to the Exchequer dam and power house of the Merced Irrigation District. The Sugar Pine mill may be visited during or after the conclave, and there are a number of substations of the San Joaquin Light & Power Corporation within easy reach of Fresno.

Mr. Cowles points out that these meetings will be the last held prior to the convention and urges that all members make an effort to attend.

P. C. E. A. Convention Committee Chairmen Appointed

The appointment of chairmen of committees that will have charge of the annual convention of the Pacific Coast Electrical Association, to be held in Los Angeles, June 8-11, at the Biltmore Hotel, has been announced by E. R. Northmore, general convention chairman. These appointments are:

Hotel—C. A. Kelley, Southern Sierras Power Company.

Reception—W. L. Frost, Southern California Edison Company.

Registration and attendance—E. H. Jones, Jones-Thorne Company.

Program—R. A. Hopkins, Westinghouse Electric & Manufacturing Company.

Local transportation—P. H. Ducker, Southern California Edison Company.

Steamship and railroad transportation—Harry L. Harper, Graybar Electric Company.

Entertainment—K. E. Van Kuran, Westinghouse Electric & Manufacturing Company.

Finance—O. L. Moore, Los Angeles Gas and Electric Corporation.

Electric Club Luncheon—S. E. Gates, General Electric Company.

Banquet—R. E. Smith, Southern California Edison Company.

Publicity—D. L. Scott, Los Angeles Gas and Electric Corporation.

Secretary of General Committee—William Haeckel, Los Angeles Gas and Electric Corporation.

The personnel of the various committees as yet has not been settled definitely.

Schedule of Meetings

Committee	Wednesday April 7	Thursday April 8	Friday April 9
Accident Prevention	10:00 a.m.	9:30 a.m.	
Electrical Apparatus		9:30 a.m.	9:30 a.m.
Hydraulic Power	10:00 a.m.	9:30 a.m.	
Inductive Co-ordination		9:30 a.m.	9:30 a.m.
Meters	10:00 a.m.	9:30 a.m.	
Overhead Systems	10:00 a.m.	9:30 a.m.	
Prime Movers	10:00 a.m.		
Safety Rules			9:30 a.m.
Underground Systems			9:30 a.m.
Joint Committee*	8:00 p.m.		2:00 p.m.
Executive Committee	6:00 p.m.		6:00 p.m.
Luncheon	12:05 p.m.	12:05 p.m.	
General Meeting		8:00 p.m.	
Social Evening and Dance			8:00 p.m.

*Note: Joint Committees of Apparatus, Overhead, Safety Rules and Inductive Co-ordination on the subjects of "Grounding," "Transformer Standardization" and "Supervisory Control."

Kansas City Meetings Outlined by Coast Delegates

Meter Committee

By R. G. Jones, Chairman Meter Committee, P. C. E. A.

Educational work seems to be paramount in all sections, and considerable discussion was devoted to this subject by the committee. This discussion brought out the fact that there is appreciable difference of opinion as to just what should be included in a proper training course for metermen. Some wish a broad scope of training while others advocate only such work as is necessary to produce a meter tester in the real sense of the term. It is evident that some thought must be given to the promulgation of proper training requirements for meter testers, metermen, and meter engineers, the three terms variously applied to men in that field.

Various problems relating to meter operation, and those causing disturbing conditions, were brought before the committee for discussion, information and advice. Many of these problems were of widespread interest.

Many new developments were submitted by manufacturers, eliciting a great deal of interest. Approval of certain of these that are to appear in the annual report of the committee was given. The matter of handling material of foreign manufacture brought out some lively arguments.

All reports being in, the editing committee was able to finish its work at this meeting. The committee adopted the general idea of reducing the volume of the annual report and fostering, instead, the liberal use of serial reports during the year. This procedure was recommended to all division chairmen.

The Kansas City Power & Light Company arranged for a very pleasant and instructive trip to all of its automatic substations. Relays of practically every known variety thus were witnessed in operating installations.

Electrical Apparatus Committee, N.E.L.A.—A 26-page serial report on Power Factor Improvement. The report is given under three classifications, power factor improvement as related to the entire system, power factor improvement on customers' premises, and a rather complete bibliography of the subject.

News of the Electragists

Full Report Inspectors' Meeting in Next Issue

A full report of the meeting of the California Association of Electrical Inspectors, held in San Diego, March 22-24, 1926, will be given in these columns in the April 15 issue, together with pictures taken during the meeting. Preliminary reports of the meeting, arriving too late for more extended notice in this issue, indicate that the program presented was of great value and that work of importance was accomplished in each of the three days' strenuous sessions.

Wattage Increases Reported by Southern Electragists

The merchandising section of the California Electragists, Southern Division, in order to establish a basis of effective business capacity is gathering from the membership of the division monthly reports on the wattage increase represented by the appliances sold that month. While these reports were at first slow in coming in, the secretary has reported that a 15 per cent increase in returned reports has been made.

The reports made for January would indicate that a total wattage of 226 kw. was sold in the appliances placed. A total of 74 of the special-campaign appliance was reported as the month's sales, representing 48 kw. This is an indication of the effectiveness of dealer merchandising in that section, taking into consideration also that the reports are as yet incomplete. Efforts are being made to get a 100 per cent report on the first of each month so that more complete summaries may be made of the results accomplished.

Roy W. Hamilton Electrical Store, 636 Market Street, Inglewood, Calif., is now under construction and upon completion will be stocked with a complete line of fixtures and appliances. Mr. Hamilton has been contracting in Inglewood for several years and now is building this store to take care of electrical fixtures and appliance sales.

Smith Electric Company, formerly at 15 Natoma Street, San Francisco, has moved to 975 Howard Street.

Pasadena Branch of Electragists Elects Officers—New officers of the Pasadena branch of the Southern Division of the California Electragists have been elected for the year as follows: president—J. B. Morgan; vice-president—C. A. Rowley, The McNally Company; secretary—H. W. Barnes, Barnes Brothers; treasurer—R. H. McCormick, McCormick Electric Shop. The branch has revised its system of levying dues and also has made provisions in its constitution whereby members automatically are dropped for unexcused absence from three consecutive meetings or for being in arrears in the payment of dues of thirty days standing.

The Crown Electric Company has opened a new fixture store at 6912 Melrose Avenue, Los Angeles. This is a barnch of the factory and showroom at 5161 S. Vermont Street. The fixture stock is extremely high class, in keeping with the district in which the branch is located.

Philip S. George, manager commercial department, Coast Valleys Gas & Electric Company (left), and S. F. Butler, city electrician, both of Salinas, Calif. They are enthusiastic members of the California Association of Electrical Inspectors.

Santa Barbara Branch of California Electragists Established.—A branch of the Southern Division of the California Electragists has been established with eleven members as follows: Alamar Electric Company, John H. Gotchel; California Electric Company, Grant Campbell; Earl O. Flagg; Gutierrez Electric Company; Heumphreus-Smith Electric Company, Don Heumphreus; McGeary Electric Company, L. T. McGeary; E. W. Huston; H. L. Miller; E. Mollenkopf; Nielson-Smith Electric Company, Wylie Nielson; and Charles Wylie.

Coast Electrical Service Club Has Red Seal Meeting

The story of the Red Seal plan was presented to the members of the Coast Electrical Service Club at its second monthly meeting held at the Hotel Taylor, Paso Robles, Calif. G. M. Rankin of the California Electrical Bureau, Fresno, was the speaker of the evening. Co-operation between contractor-dealers and the power companies was the subject of a talk by M. P. Lohse of the San Joaquin Light & Power Corporation.

The meeting then was opened for a lively discussion in which the electrical contractors took an active part. The following officers were elected: President, Lee Wilcox, coast representative of the Valley Electrical Supply Company of Fresno; secretary-treasurer, W. R. Coats, Midland Counties Public Service Corporation, San Luis Obispo. Executive committee—Lee Wilcox; C. J. Kelly, Midland Counties Public Service Corporation, San Luis Obispo; J. J. Hutchins, Valley Electric Company, San Luis Obispo; W. F. Schmidt, Guarantee Electric Company, Paso Robles; and L. E. Smart, The Electric Shop, Santa Maria.

The club is composed of the contractors and dealers and the members of the power-company organization in the territory served by the Midland Counties Public Service Corporation.

The University Electric Company has been opened at 2866 University Avenue, San Diego, Calif., where a large fixture display has been installed. The firm members are: **Layne W. Mitchell,** formerly manager of the fixture department of the Southern Electric Company of San Diego; **Robert Rayburn,** formerly in charge of the fixture shop of the same company; and **Harry Rees,** formerly in the sales department of the San Pedro Electric Company, San Pedro.

Unger Electric Company has moved into new quarters at 1045 Mission Street, San Francisco. It was formerly at 1749 Hyde Street.

Woodhill-Patterson Company, Los Angeles, has changed its name to the **Monitor Electrical Company, Inc.** The address remains the same, 118 E. Third Street.

The smiles of the Hill Electric Company, Los Angeles. C. S. Hill (left) and his son, S. F. Hill. C. S. Hill has been active in the work of the Electrical Contractors' and Dealers' Association of Los Angeles as well as the California Electragists.

Meetings

Play Features Red Seal Home at Electric Club Meeting

Depicting in a humorous vein the terrors of the modern home when incompletely and improperly wired, a one-act play entitled, "Listen George," written by Richard E. Smith, advertising manager of the Southern California Edison Company, was presented at the Los Angeles Electric Club luncheon Monday, March 15.

This playlet was produced as a part of the campaign now being carried out by the Los Angeles Red Seal committee of the California Electrical Bureau to introduce and popularize the Red Seal plan of certified electrical contracting. Prominent realtors, architects, and builders were invited to be present at the presentation of the skit, and as a consequence more than 500 attended the luncheon.

The playlet portrayed the average man and wife developing the desire to build and own a home and brought out the obvious advantages to be gained by making it a Red Seal home, with all that that implies. The play was received enthusiastically and it was apparent that the Electric Club had selected an effective method by which to carry the story of the "Red Seal" to the allied arts and industries.

H. E. Sherman, Jr., vice-president and sales manager of the Illinois Electric Company, and chairman of the Los Angeles Red Seal committee of the California Electrical Bureau, acted as chairman of the day. Preliminary to the presentation of the play he read a resume of the history, purpose and expectations of the results to be derived from the Red Seal plan which served to introduce the general idea to the guests of the day.

The Los Angeles Gas & Electric Corporation orchestra supplied the musical numbers.

San Diego Electric Club Gives "What Price Light?"

In connection with the annual banquet and election of officers of the San Diego Electric Club, the play "What Price Light?" was given. This is the play which was circulated by the National Electric Light Association in conjunction with the industrial lighting campaign, and it was received enthusiastically by a capacity audience of dealers and contractors.

Cast of "What Price Light" as put on by the Electric Club of San Diego at its annual meeting.

The cast included the following: Roger Ruffin, easement engineer, San Diego Consolidated Gas & Electric Company; Walter Chapman and A. C. Petrich, new business department of the same company; and Ralph Chase, representative of the Westinghouse Electric & Manufacturing Company. Roger Ruffin as the gruff, "hard-boiled" factory superintendent, took his part in a most realistic way; Ralph Chase as the Quicklite representative, was the typical high pressure, put-your-name-on-the-dotted-line salesman, and Walter Chapman, as the "dumbell" redheaded electrician proved himself a clever actor. A. C. Petrich capably played the part of a progressive salesman who knew how to sell correct lighting on scientific principles.

The consensus of opinion of those in attendance was that the story of good factory lighting could not have been presented in a more effective way.

COMING EVENTS

Technical Conclave, P.C.E.A.—
San Joaquin Power Building, Fresno, Calif., April 7-9, 1926.

Advertising Section, P.C.E.A.—
San Francisco, Calif., April 30, 1926.

National Electric Light Association—
Annual Convention—Atlantic City, N. J. May 17-21, 1926.

Electrical Supply Jobbers' Association—
Annual Convention—Hot Springs, Va. May 31-June 4, 1926

Pacific Coast Electrical Association—
Annual Convention—Biltmore Hotel, Los Angeles June 8-11, 1926

Associated Manufacturers of Electrical Supplies—
Annual Convention—Hot Springs, Va. June 7-12, 1926

Northwest Electric Light and Power Association —
Annual Convention—Spokane, Wash. June 14-17, 1926

Northwest Electric Light and Power Association —
Annual convention — Spokane, Wash. June 16-19, 1926.

Illuminating Engineers Present Store-Lighting Symposium

The San Francisco Bay Cities Chapter of the Illuminating Engineering Society inaugurated a unique method of studying practical illumination problems at one of its recent meetings.

Two of the members, unknown to each other, previously had been presented with a plan of a shoe store by the program committee and asked to submit their recommendations for a lighting layout at this meeting.

Each of the two members was allowed fifteen minutes to present his recommendations and discuss them. Although each layout was quite different, each provided an adequate lighting installation. Following this the floor was opened for discussion of the two plans by all of the members. Many interesting differences of opinion were brought out. The program was well received by the members, and similar symposiums covering various phases of illumination will be presented at future meetings.

Entire Office Building Used in Employees' Jollification

More than 4,200 employees of all departments of the Los Angeles Gas and Electric Corporation, their wives and children, were present at a huge New Year's reception and party held Jan. 8 in the company's main office building.

Headed by William Baurhyte, president, and Mrs. Baurhye, and A. B. Day, vice-president and general manager, and Mrs. Day, all the company officials and department heads and their wives formed a receiving line which greeted all those in attendance.

Practically every floor of the building was utilized for some entertainment feature, and the whole structure was thrown open "from cellar to garret" for inspection.

Three orchestras, all made up entirely of company employees, furnished music for dancing on the seventh, eleventh and twelfth floors. Provisions were made also for those who desired to play cards. Many other forms of amusement and entertainment were also in evidence, the tenth floor being given over to the "Honky Tonk" amusement zone where thirteen different brands of fun were in operation. Refreshments of several kinds were served also.

Ample provision was made for the care of the children who attended the party. On the eighth floor a "Kiddy Korner" was prepared with competent attendants in charge, and entertainment and refreshments were provided for the youngsters.

Long Beach Electric Club Holds St. Patrick's Party

The annual St. Patrick's party of the Electric Club, Long Beach, Calif., was held Tuesday evening, March 16, with over one hundred members and guests in attendance. The affair, in the form of a dinner dance, was held at the Ebell Club.

Green and white decorations were employed in the banquet room and the same color scheme served for the table ornaments. A miniature stovepipe hat and small clay pipe were presented to each of the guests. Irish melodies were played by Miss Grace Gogerty, harpist, during the course of the dinner. She also led the gathering in community singing.

The speech of welcome was delivered by Robert Abright, president, while short addresses were made by Dr. Edward Bailey, the first president of the club, and Joseph Lane. J. C. Kyle was chairman of the entertainment committee.

Electric Club of San Diego Names New President

At a special meeting of the Electric Club of San Diego, Calif., on March 16 Ray C. Cavell, superintendent of the record department, San Diego Consolidated Gas & Electric Company, was named president following the resignation of C. C. Clardy who, due to pressure of personal business, found it necessary to give up his post as president of the club.

The other officers of the club are: Vice-president—C. A. Stevens; secretary-treasurer—Percy H. Adams.

Personals

E. O. Shreve, who has been San Francisco district manager of the General Electric Company since 1917, has been appointed manager of the industrial department of the company

E. O. SHREVE

with headquarters in Schenectady, succeeding the late A. R. Brush. Mr. Shreve was born in Mapleton, Iowa, Oct. 31, 1881. Following a common school education, he found his first employment as a Western Union messenger for the Chicago, Milwaukee & St. Paul Railroad at the princely salary of $8 a month. After studying telegraphy he became station agent for that railroad at Harrisburg, S. D., and later was night operator at Charter Oak, Iowa. He left that work to enter the Iowa State College at Ames, from which he was graduated in 1904 with the degree of B. S. in electrical engineering. He then entered the employ of the General Electric Company as a student engineer in test. After completing his student course, he entered the supply department in 1905, and a year later was sent to San Francisco as a supply salesman, covering all of the San Francisco outside territory. Afterward he was given the responsibility of the Nevada territory on all lines of equipment and supplies, with headquarters at Reno. About 1909 he was transferred to the San Francisco office as turbine specialist, and the following year he became apparatus salesman. In 1912 he was made manager of the industrial department, and in 1916 was promoted to the position of assistant manager of the San Francisco office. The next year he became manager, succeeding the late Tracy E. Bibbins, who was transferred to the Pacific States Electric Company as president. Apart from his official duties, Mr. Shreve has been keenly interested in the welfare of the industry as a whole, and always has been in the forefront of any movement that contributed to its welfare. He is a past president of the San Francisco Electrical Development League, has served on the executive committee, Public Relations and Commercial Sections of the Pacific Coast Electrical Association. He was one of the founders of the California Electrical Bureau and has served on the advisory, finance and other committees. He was general convention chairman of the P. C. E. A. meeting in San Francisco in 1923, and was a member of the general convention committee and chairman of the finance committee for the N. E. L. A. convention in 1925. He is now chairman of the finance subcommittee of the Committee on the Relation of Electricity to Agriculture. Mr. Shreve is a member of the American Institute of Electrical Engineers and of the American Society of Mechanical Engineers and belongs to the Pacific Union, Engineers, Commonwealth, Claremont Country and Mt. Diablo Country Clubs.

Robert Prince, formerly in the warehouse of the Graybar Electric Company at Emeryville, Calif., has been transferred to the sales department of the company's Oakland branch.

H. G. Gross, president, American Ironing Machine Company, Chicago, was a visitor in San Francisco a short while ago. Mr. Gross has been making an intensive study of the ironing-machine market in the West, visiting the leading distributing centers both in the Northwest and California.

H. T. Plumb, engineer of the General Electric Company, Salt Lake City, recently delivered an illustrated lecture on "Fundamentals of Illumination" before the members of the Utah Society of Engineers.

W. W. Briggs, vice-president and general manager, Grays Harbor Railway & Light Company, Aberdeen, Wash., discussed "Pleasure in Business" before a meeting of the Chamber of commerce of Montesano, Wash., not long ago.

J. C. Gaylord, of the engineering department, Southern California Edison Company, Los Angeles, recently visited San Francisco on his return from the meetings of the Technical National Section, N.E.L.A., in Kansas City.

E. S. Carpenter, formerly Pacific Coast manager of the Aluminum Company of America, has become affiliated with the appliance sales department of the Graybar Electric Company in San Francisco.

A. S. Price, formerly assistant power engineer, Southern California Edison Company, has been transferred to the protection engineering department of the company as assistant protection engineer under the supervision of **E. R. Stauffacher.** Mr. Price has been connected with the Edison company in various departments for a number of years.

G. H. Whitney, who has been connected with the protection department of the Southern California Edison Company for some time, has been made supervisor of protective equipment for the company's northern division, and **C. H. Hagey** has been given a similar position with reference to the central and eastern divisions. Mr. Hagey has been associated with the Edison company for over twenty years. Both men conduct a field supervision of all the equipment under the jurisdiction of the protection department.

Chester Turlay, Vancouver, Wash., manager for the Portland Electric Power Company, has been elected a member of the board of trustees of the Federated Industries of Washington.

Miles W. Birkett, vice-president and general manager, The Washington Water Power Company, Spokane, returned recently from a five-weeks trip through California.

R. B. Childs, of the commercial department, and **Richard McKay,** of the engineering department, The Washington Water Power Company, Spokane, spent two days in Butte, Mont., a short while ago with officials of the Montana Power Company discussing problems relative to the interconnec-

T. H. Jordan, assistant district manager, the Hurley Machine Company, Seattle, spent a few days in Spokane not long ago.

Markham Cheever, formerly chief engineer and general superintendent of the Utah Power & Light Company, Salt Lake City, has accepted an appointment on the staff of the Electric Bond & Share Company of New York. For the past fourteen years Mr. Cheever has been associated with the Utah Power & Light Company as chief engineeer. He took up the additional duties of general superintendent in 1918. Mr. Cheever was born in Ann Arbor, Mich., and was graduated from the University of Michigan in 1903. Immediately after his graduation he became assistant engineer with the Ontario Power Company during the construction of the first section of the power development plans of Niagara Falls. From this company he went to Colorado and accepted a position as engineer in charge of the construction of a hydroelectric plant at Ames, Colo. From 1908 to 1912 he served with the Telluride Power Company as assistant chief engineer. When the Utah Power & Light Company was formed in 1912 by the consolidation of a number of existing companies, Mr. Cheever was made chief engineer. Under his direction the great Bear River system, now operated by the Utah Power & Light Company, which is noted throughout the country as a highly efficient system,

MARKHAM CHEEVER

embodying a tremendous water-storage development, absolute stream control and large generating stations, was created. Mr. Cheever has taken an active part in the affairs of the American Institute of Electrical Engineers, the American Society of Mechanical Engineers and the National Electric Light Association, having served as chairman of the hydraulic power committee of the Technical Section.

Edgar Kobak, since 1924 assistant vice-president of the McGraw-Hill Publishing Company, Inc., has been made a vice-president of that company, a director and a member of the executive committee. His new position makes Mr. Kobak head of the electrical unit, which includes the electrical journals published by the company, and general sales manager of all of its publications. In the latter capacity he will be responsible for the operation of the amended selling plan recently announced by the McGraw-Hill company. Mr. Kobak has made rapid progress in the publishing field. He entered the employ of the McGraw-Hill company as a subscription and field representative about ten years ago and in less than a year was appointed to the staff of Electrical World as assistant engineering editor. After two years in that position he spent two years in the Chicago territory as advertising salesman for the Journal of Electricity, Electrical Merchandising and Electrical World and one year in St. Louis. Then he was made promotion manager of Electrical World, with headquarters in New York, subsequently becoming business manager of that publication and of the Industrial Engineer and later assistant vice-president.

W. L. Fitzpatrick, since 1912 connected with the Tacoma Gas & Fuel Company, Tacoma, and allied companies, has been appointed general auditor of the Mountain States Power Company, of which the Tacoma Gas & Fuel Company is a subsidiary. Mr. Fitzpatrick was born in Marinette, Wis., in 1889. After completing high school in Marinette, he spent two years with the N. Ludington Lumber Company of that city. In June, 1912, he moved to Tacoma and the fall of that year found him in the employ of the Tacoma Gas & Fuel Company as inventory clerk. He soon was given charge of the storeroom and later transferred into the general bookkeeping department. In 1918 he was made

W. L. FITZPATRICK

assistant treasurer, and in 1922 treasurer and auditor of the Tacoma company, the Puget Sound Gas Company, Everett, Wash., and the Olympia Gas Company, Olympia, Wash., a position he held until his recent promotion. His present position gives him jurisdiction over the accounting departments of all divisions of the Mountain States company in Washington, Oregon, Idaho, Montana and Wyoming.

J. O. Presbrey, of the Ivanhoe Division of The Miller Company, Cleveland, was in San Francisco recently en route to Arizona.

E. M. Herr, president, Westinghouse Electric & Manufacturing Company, recently visited the Pacific Coast during a nation-wide tour. While in San Francisco he was the guest of honor and principal speaker at a meeting of the San Francisco Electrical Development League.

R. C. W. Libby, who has been representing Landers, Frary & Clark, New Britain, Conn., in the Intermountain territory, has resigned and gone East to join the sales staff of H. G. Weeks Manufacturing Company, Hamilton, Ohio.

M. Luckiesh, director of the laboratory of applied science at Nela Park for the National Lamp Works of the General Electric Company, took a prominent part in the course in lighting instruction recently given by the Public Service Company of Colorado, Denver, to its commercial employees.

Z. T. Pettit, of the Los Angeles Gas and Electric Corporation, has been promoted to the position of underground electrical engineer, filling the vacancy caused by the death of O. C. Miller. Mr. Pettit entered the service of the corporation Sept. 20, 1905, as a lineman, and served in various capacities until Jan. 1, 1924, when he was made foreman, a position which he has relinquished to assume his present one.

R. G. Gentry, manager public relations department, Public Service Company of Colorado, Denver, not long ago completed the twenty-fifth year of his service with that company.

J. C. Douglas, formerly connected with the Edison Electric Appliance Company, San Francisco, has resigned to become manager of sales promotion for the Johnston-Ayres Company of that city.

C. B. Huston, formerly associated with the Wholesale Electric Company, San Francisco, has entered the service of the Dictograph Products Corporation, New York, with offices in the Monadnock Building, San Francisco. He will specialize on intercommunicating telephone systems.

Frank J. Kiefer, formerly plant superintendent, White Pine Products Company, Alameda, Calif., has joined the staff of the California Electrical Bureau with which he was at one time connected.

Harvey E. Brundage, of the Cline Electric Manufacturing Company, San Francisco, was in Spokane a short time ago.

Carl L. Hoffman, of the commercial department of The Washington Water Power Company, Spokane, has been placed in charge of the sales of heavy-duty cooking equipment.

Dr. C. A. Sawyer, of Evanston, Wyo., has been elected a director of the Utah Power & Light Company to succeed General Bulkeley Wells, of Telluride, Colo., who is also president of the Western Colorado Power Company. Dr. Sawyer is a director of the Evanston National Bank and is also superintendent of the Wyoming state mental hospital at Evanston.

W. F. Raber, vice-president and general manager, San Diego Consolidated Gas & Electric Company, recently returned from a short trip to Los Angeles.

Frank Schram, manager, Southwestern Public Service Company, Roswell, N. M., is the new president of the New Mexico Utilities Association, having been elected to that office at the recent annual convention of the organization in Albuquerque. Mr. Schram has been identified with the public-utility business of New Mexico for the past ten years, having served with the several predecessor companies of the present Southwestern Public Service Company. He plays an active part in the affairs of the electrical

FRANK SCHRAM

industry in that section of the country, and was the pioneer in public-relations work in New Mexico. At the present time he is a member of the Rocky Mountain Committee on Public Utility Information. Mr. Schram also finds time for interests outside of the electrical field, one of them being the Advertising Club of Roswell, of which he is president.

R. W. Murphy, Pacific Coast manager, Westinghouse Lamp Company, San Francisco, recently left on an Eastern trip in the interests of his company.

Obituary

Richard H. Stretch, who under the title of county surveyor had charge of city engineering for San Francisco in 1872 and 1873, died in Seattle March 22.

Charles C. Gray, general sales manager, the Detroit Insulated Wire Company, Detroit, died in that city March 16. Mr. Gray for many years was connected with the Westinghouse Electric & Manufacturing Company at East Pittsburgh.

Thomas G. Whaling, vice-president of the Westinghouse Lamp Company, died suddenly in New York City March 1. Mr. Whaling joined the Westinghouse Lamp Company in 1906 as assistant to the manager, and held the successive positions of sales manager, assistant general manager, general manager and vice-president. He was widely known in the electrical industry as one of the pioneers and early leaders in the lamp industry.

TRADE NOTES

Apex Electrical Distributing Company has discontinued its Denver office. Hereafter a local service agency only will be maintained by **Robert G. Park. H. P. Whitten,** division manager, has been transferred to Seattle, where he will assume management of the **Electrical Utilities Company,** which operates a chain of retail Apex-Rotarex stores in the Northwest.

Curtis Lighting, Inc., Chicago, has announced a change in its Southwesteern territory. **F. H. Simmer,** formerly resident engineer in the Indiana territory, has been transferred to the Southwestern and now represents Curtis Lighting, Inc. in the states of Texas and Oklahoma, with headquarters in the Republic Bank Building, Dallas, Texas. He succeeds **G. K. Clement** in that territory.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, recently has completed a new line of industrial panelboards for the control of lighting systems in offices and factories. These panelboards are made in sizes supplying from 4 to 32 circuits and in capacities ranging from 30 to 100 amp. The Westinghouse circular DMF M-314 describes these panelboards in detail and lists complete ratings and capacities.

The American Resistor Corporation, Philadelphia, has recently opened branch offices in Cleveland and San Francisco, making six in all, the others being located at New York, Philadelphia, Los Angeles and Milwaukee.

The Eaton Electric Furnace Company of Taunton, Mass., has issued a bulletin entitled "Eaton Electric Furnaces," descriptive of the Globar cartridge-type heating elements for operating temperatures of 1,600 deg. to 2,350 deg. F.

Electro-Kold Corporation, Spokane, has issued a folder illustrating the complete Electro-Kold line of electric refrigeration. The various sizes and styles are shown and complete details given.

The Arrow Electric Company, Hartford, Conn., has issued a reciprocating heater-switch catalog. The book is well illustrated with drawings and photographs and contains a complete price list.

Trico Fuse Manufacturing Company, Milwaukee, has made many changes in its plant. The electrical testing laboratory has been enlarged and rebuilt with the latest and best equipment. The offices also have been enlarged, new lighting equipment has been installed in the factory, and production facilities considerably increased.

Foxboro Company, Inc., Foxboro Mass., has moved its Chicago office to 204-206 St. Clair Building, 154 East Erie Street.

Electrical Testing Laboratories, New York, has issued a new bulletin, No. 101, entitled "Testing, Inspection, and Research Work," on impregnated paper-insulated lead-covered cable. The book is well illustrated with photographs.

The General Electric Company, Schenectady, N. Y., recently issued a publication bearing the designation GEA-306, a twelve-page illustrated bulletin devoted to the electrified first line battleships and airplane carriers in the United States Navy.

The Hisey-Wolf Machine Company, Cincinnati, has issued a small pocket catalog describing the new Hisey double-slide angle plate grinder. The catalog is illustrated with photographs and drawings and contains complete tables of the types, volts, capacity and weight.

Burndy Engineering Company, Inc., New York, has issued a catalog descriptive of the Burndy T-connectors for tubing cables and solid buses. Complete descriptions and price lists are given.

The Louis Allis Company, Milwaukee, Wis., has developed a new direct-current motor, known as type N. A., which is described fully in engineering bulletin No. 226 now available for distribution.

Grant Gear Works, Inc., South Boston, has issued recently a complete 100-page catalog and price list of iron cut gears, brass cut gears, cast gears and gear wheels.

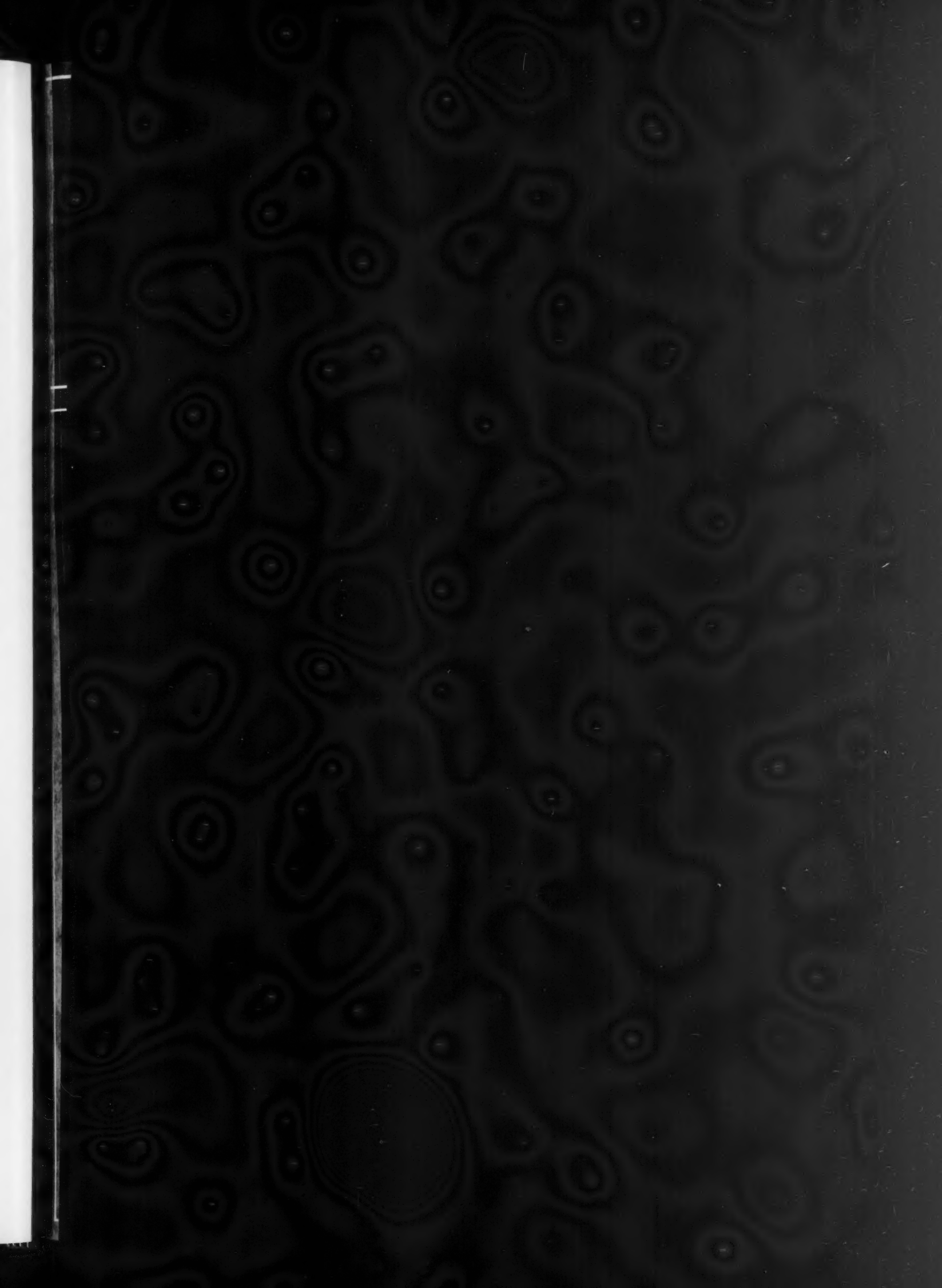
The Armstrong Manufacturing Company, Huntington, W. Va., is featuring its latest development in an automatic electric range in literature just issued. The concern also is issuing small booklets of tested recipes suitable for its table stove.

The Robbins & Myers Company, Springfield, Ohio, recently has developed a new type of 36-in. alternating-current ceiling fan as illustrated and described in its booklet.

Walker & Pratt Manufacturing Company, Boston, recently has placed in the Western market its new Crawford electric ranges 18-92 and 16-82. The 18-92 range is equipped with four surface elements, two of 1,500-watt and two of 1,000-watt capacity. The oven is 18 x 18 in. with a height of 15 in. and the interior is enameled in blue. Two 1,500-watt elements are installed in the oven. This model comes in full white enamel or in black Japan with white enamel oven door and splashers. The 16-82 range is slightly smaller, having only three surface elements, two of 1,500-watt and one of 1,000-watt capacity. The oven is 16 x 17 x 14 in. and has two 1,500-watt elements installed. It is lined with blue enameled metal. This model is furnished only in black Japan with white enamel oven door and splashers. The two new models may be had with or without Crawford temperature control or Crawford temperature and time control. These ranges are furnished with either right or left-hand ovens. Graybar Electric Company is distributing the Crawford ranges in the western territory.

Eureka Tool & Machine Company, Newark, N. J., has issued recently literature describing the Eureka time switch, which automatically switches lights on or off at any desired time. The company also is featuring a new toaster to retail at $2.95.

Wagner Electric Corporation, St. Louis, has developed a lower priced three-speed 10-in. oscillating fan that will retail at $16.50. It is powered with a well-insulated, well-ventilated Wagner induction motor, cool and quiet in operation, having no brushes or commutator to wear out. The fan can be used either for desk or wall mounting.

Crouse-Hinds Company, Syracuse, N. Y., has issued bulletin No. 2084, which describes and illustrates its flexible fixture hangers. Complete price lists are given.

"Omy, omy," thinks Arthur Prager, manager of the Albuquerque Gas & Electric Company, Albuquerque, N. M., and host to the recent convention of the New Mexico Utilities Association. "Omy, omy, what a golf rig that would be!" The Jemez Pueblo Indian chief, who is reading a paper on inductive interference or something equally esoteric, doesn't realize that he is causing his guests at the reservation so much sartorial envy. Next year's golf togs may well be in Pueblo blanket styles, if Lucille or whoever sets the styles can only get the Indian sign on them.